# ESSAYS IN OPHTHALMOLOGY.

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# PREFACE.

As I am quite unknown beyond the confines of a limited circle, I feel some diffidence in publishing these Essays, most of which contain theory and practice different from what obtains in the profession.

But as scarcely a day passes without giving an illustration of the truth of some statement contained therein, and since I have been encouraged by the cautious approval of two gentlemen of repute in Ophthalmology, I venture to bring these Essays before the profession, in the sure hope that they may be fairly considered and fairly judged.

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"Against Glaucoma, in *all its forms*, and from their commencement to their termination, the resources of the Pharmacopœia are utterly useless. They are worse than useless, for their employment wastes time and loses opportunity. The only remedy for the disease is the operation of Iridectomy."

"The *rationale* of the relief to tension afforded by Iridectomy has been much discussed, but it is not even yet a subject on which entire agreement has been reached. It is obvious that the incision, by permitting the escape of the aqueous humour, must both soften the eyeball and liberate its circulation; but this does not explain the matter, because, after a mere paracentesis, the tension reasserts itself with great rapidity. The permanent effect is probably due to three elements; first, to the diminution of the secreting surface of the iris; secondly, to the removal of so considerable a portion of the solid contents of the eyeball; thirdly, to the establishment of a line of comparatively permeable cicatrix, through which exhalation or exosmosis may take place freely, in the previously dense and rigid sclerotic. Whatever be the explanation, the fact remains. Tension is actually diminished by Iridectomy, and is diminished almost in proportion to the size of the piece removed, and to the completeness with which certain precautions are observed during the operation." *

* *Diseases of the Eye*, by R. Brudenell Carter, page 414.

## CHAPTER I.

It is somewhat singular that a method of stopping the Glaucomatous process, originating almost simultaneously from two English surgeons, Hancock and Nunneley, men who had distinguished themselves so highly in other branches of surgery as to entitle their opinion to be of weight, should have met with such a chilling reception, and been abandoned so hastily. It is to be feared that fashion in these matters has a good deal to do with the adoption or rejection of an operation, and there may be something in this, that the so-called Hancock's operation is, or seems to be, wrongly as I take it, so much easier to do than the popular Iridectomy, and therefore less likely to shew off the skill of the operator.

It is strange to read some of the

reasons which have been given for its rejection. The English writer, a quotation from whom is at the head of this paper, gives as his reason for its rejection, that in the first case in which he tried it the eye was lost. How much was due to faulty selecting of case or to method of operating he does not say, and surely in condemning a useful operation on such slender grounds, he ought to have given a full history. I have no doubt that if Iridectomy had shared the same fate, a great advance would have been made in ophthalmic surgery some time ago.

Iridectomy, because it succeeds, for a time at least, in stopping acute Glaucoma, has been tried for almost every imaginable disease of the eye; and if in any given case the eye were lost, it was the fault of the eye and not of the operation. A reaction, however, has recently set in. Two operations have been introduced for the cure of Glaucoma; one called Sclerotomy, which is simply the incision for Iridectomy,

without the excision of the iris, is, fortunately, an operation of so transparently honest a character, that it has already had its day, although only a bantling of some few months.

The objections to it are so obvious theoretically, and have been so fully borne out in practice, that surely only the name of its inventor saved it from being still-born. The objections are, first, that the iris is almost sure to prolapse, and second, that a more favourable wound for the causation of sympathetic inflammation could scarcely be designed. The other operation is that of Trephining the Sclerotic; but, as the cases given by the author are far from favourable, it is not likely to make much headway.

Before treating of this subject, I must confess that I was never enthusiastic about Iridectomy. The removal of a large piece of impeccant membrane, without explicable cause, was always repulsive to me; and, though I have practised it, I have always

done it unwillingly, save for artificial pupil and such like, whilst I have done Hancock and Nunneley's operation frequently, but mostly using the knife less freely than the authors recommend.

To shew Iridectomy at its best, a fitter example cannot be afforded than one of double acute Glaucoma, narrated by Mr. Charles Higgens, of Guy's Hospital, in the Ophthalmic Hospital Reports, of September, 1875. A woman of 62, three weeks before being seen, was attacked at night with violent pain in the right eye; next morning she found herself quite blind, and remained so until her visit, when the usual signs of Glaucoma were found, with doubtful perception of light. On the next night she had similar symptoms in the left, and next morning it was found to be as bad as the right. A large Iridectomy was done in each eye, and four days after she could count fingers, tension being normal.

Twenty-five days after the first opera-

tion, a second Iridectomy was done on each eye, downwards, on account of return of increased tension. One hundred and twenty-one days after the first, and ninety-six after the second operation, patient with the right read $2\frac{1}{2}$, and with left $6\frac{1}{2}$.

We are not told whether she had glasses, though, unless it were myopic, one would scarcely expect such good sight, as in the right, in a perfectly sound eye at her age. There are some remarks on the case, most of which are not pertinent to my purpose, but the last paragraph is highly so, therefore I quote it: — "A case shewing in a more marked manner the efficiency of Iridectomy on Glaucoma could hardly have occurred; the patient was certainly rescued from complete and irremediable blindness by its performance." The writer evidently is well satisfied with the result, and doubtless it is a matter of congratulation to have been able to give a patient such sight as above described, even for a time. But at what a cost!

How long an eye so mutilated will keep fairly sound it is impossible to tell, but I daresay most oculists have seen cases wherein, after one Iridectomy, an eye has developed cataract, softened with great pain, and finally undergone enucleation.

A case occurs to me in point. A lady, aged 50, came to me some three years ago suffering from intense pain in the eye, coming on in long and frequent paroxysms. Some years previously she had had an acute Glaucoma of this eye, for which she was iridectomized by a very eminent oculist in London; the operation removed the pain, and she regained her sight to a great degree; but soon afterwards a similar attack affected the other eye, with the like treatment and result. However, the sight of the first eye waned, and became extinct some time before I saw her. I found a globe softened, diminished in size; a cataractous lens pressing forward against the remains of the iris, which was greatly atrophied. Vision

was much impaired in the other, though there was no marked softening. As quietly as possible I advised enucleation as the sole means of relieving her permanently of pain, and she consented. But, as often happens in cases of proposed operation, she changed her mind; and, after begging for delay for a few days, she informed me that she had decided to consult her former adviser. To my great surprise he told her that her symptoms could be relieved by leeching and blisters. The authority was so eminent that I had no alternative but to bow to it, and the patient was leeched and blistered freely. Unfortunately, the eminence of the authority could not reverse all experience, and the weakening effect of the treatment had, of course, the result expected, of making the patient suffer still more. Three months after my first seeing her she again went to London, and submitted to enucleation at the hands of the eminent man who had advised the attempt

by leeching and blistering to cure pain caused by a softened eye, with lens pressing on iris.

I have since learnt that the second eye, from which, I forgot to mention, the lens had been removed on account of its becoming cataractous, has lost all power of sight.

I imagine that this is no rare case; and when we consider what an important part the iris plays in health, and what a potent engine of mischief it is constantly shewing itself in disease, one cannot but be lost in amazement that such free mutilation, as in the above case, should be advised and practised by so many eminent authorities, and considered harmless. Future generations, physiologists as well as ophthalmologists, surely will stand appalled at the way in which the iris has been cut about in the last quarter of a century. The iris has been treated like the blood used to be before the late reaction against bleeding. To use the phrase

of an eminent living physiologist, "The blood was looked on as a noxious fluid to be got rid of, the quicker the better." So the iris has been cut about for everything. It has been cut out, not only for Glaucoma, where, at any rate, there is some shew of reason for it, though it is somewhat difficult to understand why Hancock's operation, faulty though it be, has not superseded it; but it has been introduced into the operation for cataract, with the effect of at least doubling the wound of the eye; and for what? To prevent prolapse of the iris, for that is all it comes to; the lens comes out through the normal pupil as easily as through a large coloboma, if the external wound be big enough.* It has, moreover, been prescribed for ulcers and other inflammations of the cornea, wherein did ophthalmic surgeons practise as they would on other parts of the body, they

* Any one who has seen a cataract dilate, and come easily through, a pupil contracted to a pinhole by eserine, will see that this statement is no exaggeration.

would attack the *locus* of the disease, and with far better and quicker results, and with the least possible damage to the eye.

All these things are done now, and have the sanction of the highest authorities. Iridectomy has been tried in other diseases, but the absurdity has been so manifest, that even the most enamoured of the operation have given it up. Conical cornea is an example of this; but what is perhaps the crowning absurdity has occurred lately. It has been tried and recommended in Pigmentary Retinitis.

The explanation of the curative action of Iridectomy is still involved in darkness. The old theory, scouted by the dying Von Graefe, of its being an efficient paracentesis, has been recently revived under another name. The operation is said to produce a "cicatrix of filtration;" that is, the scar resulting from the union of the wound is more permeable to fluid than the normal tissue. If this be the

case, then, of course, Iridectomy proper, *i.e.*, the excision of the iris, is useless, and the incision in the sclerotic only serviceable. *But if the cicatrix be more permeable than normal tissues, it differs from cicatrices in other parts of the body. Take the cicatrix of a burn. Is it not notorious that this remains dry when the sound skin adjacent is bathed in sweat? Of course the wound made for Iridectomy in chronic glaucoma is often a long time in healing soundly, and during this time it acts efficiently enough against increase of tension, but it acts equally well against increase of the goodness of vision.

* Later on, I shall shew that filtration, by either permeable cicatrix or actual fistula, can afford no relief to Glaucomatous symptoms. The tension may be kept down, but true absorption, the only real relief to Glaucoma, does not take place.

## CHAPTER II.

The steps by which I have been gradually led to give up Iridectomy, as a treatment for Glaucoma and its allies, are as follows.

I have said above that I have never liked the operation of Iridectomy, on account of there being no reasonable explanation of its action, and of the apparent needless removal of the iris, so that it was only necessary to come across a striking failure for me to be induced to seek for a substitute. Such a failure occurred to me in the Spring of 1876, when I iridectomized one eye of a man affected with double chronic Glaucoma in an advanced stage. A cystoid cicatrix followed, and only healed after the patient had been to a convalescent hospital for several weeks. After this I operated on the other eye, and, to my

great chagrin, with the same result, although the man was in much better health than when the first operation was performed. Shortly afterwards, in May, a woman, aged 30, presented herself for incomplete congenital cataract, which I needled, as I thought, cautiously. Nevertheless I found, on seeing her two days later, that the eye was the seat of acute Glaucoma, the tension being 3 +. Having had an unfavourable experience of the treatment usually adopted in such cases, that is, of making a large opening, and removing as much cataract as possible, and being equally unwilling to perform Iridectomy, I determined to do Hancock's operation; and having persuaded her with great difficulty to submit, for she was almost mad with pain, I divided, precisely after Hancock's fashion, the ciliary body. On account of the fulminating character of the Glaucoma, I did this much more freely than I had ever done before, the result being that the pupil was dragged

up considerably, the iris and ciliary body prolapsing. The pain, however, was at once extinguished, and the solution of the cataract went on more quickly than any I had previously seen. But I recognized that this prolapse of the iris and ciliary body was a danger that ought to be eliminated, and set to work to think how this should be done. I had immediately after this a similar case in a boy, who, being half-witted, was difficult to control. One eye had already been needled with perfect success, but after the second had been operated on, Glaucoma supervened, probably through exposure to cold. Here, without exactly formulating in my own mind the operation described below, I made, as I had usually done before in such cases, a cautious radial cut in the sclerocorneal junction, the knife — a triangular one — piercing the iris, and dividing the ciliary body. The same relief followed as in the last case, without any black cicatrix, shewing, therefore, that there was no prolapse,

and the solution went on as in the previous case.

Now here I had two striking instances of relief in acute Glaucoma, from a very limited incision, pure and simple, for no lens matter escaped through the opening; and I suppose that no one will argue that the outflow of a few drops of aqueous would influence the result in any way. At the same time, I could not help thinking that the very minute cut in the sclerotic had little or nothing to do with the result, and recognizing the great danger of the prolapse of the ciliary body, I sought for a means of dividing the ciliary body without incurring the risk of prolapse either of the iris or ciliary. This I saw could be accomplished in the manner described below, and soon had a typical case in which to try it.

I was asked, on December 3rd, 1876, by my friend, Dr. Raverty, of Bootle, to see a tradesman, about 55 years old, whom I found to be suffering from acute

Glaucoma; T = 3 +, and he could only count fingers. The patient said he had felt symptoms about a week before, iridescence and increasing pain, the increase being very rapid in the last four days; a great exacerbation following the instillation of atropine, three days before I saw him. I prescribed an opiate, and next day operated thus. The patient was fully etherized in a sitting position, then the lids being opened by the wire speculum, I pinched up the conjunctiva with toothed forceps, slightly to the inner side of the vertical diameter below, and then thrust perpendicularly through the cornea, well within transparent tissue, a very narrow knife, edge upwards, exactly opposite to the point held by the forceps; then, depressing the handle so as to bring the knife-edge parallel to the curve of the tunics, I thrust it through the iris, and slowly withdrew it, cutting, as I did so, everything up to the sclerotic. I felt a distinct sensation as of cutting a gristly body as I made the return incision. The

pupil, up to this time of a medium size, dilated at once towards the wound, and then all round. Some aqueous, and then a little blood, followed the withdrawal of the knife, and the eye was then bound up. Three days afterwards I saw the patient, and heard that the dull, heavy pain had been immediately exchanged for smarting, and soon afterwards for absolute ease. When I saw him he was free from pain, the eye was only slightly congested, and the sight much improved. Afterwards there was no drawback, and the eye soon became well. The patient was asked to come to my house to be tried for glasses, but neglected to do so. Some months after, I met him casually, and found he required, for distant clear vision, about 16 +, and for near vision about 6 +. This was guessed at by a rough trial with spectacles borrowed from bystanders at the time.

Considering the ease with which I found I could divide the ciliary muscle,

without incurring the risk of prolapse, I was induced to perform the same operation the next day on a girl, aged 21, whom I had in the hospital for months, on account of Hutchinson's disease. She had been kept under the influence of mercury and atropine without material benefit, and at this time there was much ciliary injection, vascularity of cornea, and great photophobia, the right eye being much the worse, a large triangular yellow patch occupying the upper sixth of the cornea in addition. The next day I found the tense, weighty pain was exchanged for smarting. There was much less redness, and in a fortnight there was none, the cornea, meantime, clearing up greatly. As the left eye was still painful, with much evidence of cyclitis, I operated similarly on it about three weeks after the right: in a week it is noted, "eye cleared up greatly," and in another week, "both quite free from redness, and corneæ clearing." Not to be

wearisome, I may mention, without giving full histories, that I have operated on many cases of Hutchinson's disease, and in all cases with good result, the great pain, often seen in cases either neglected or wrongly treated for a long time, being in all greatly relieved. I am bound to say that I have had in some few cases of long standing to repeat the operation more than once; and I do not hold it out as a cure for the disease, but as a valuable help to the only true treatment, namely, efficient mercurialization. Relief, however, was always given, and an advance towards cure made, by each cyclotomy.

Soon afterwards, two patients, with chronic Glaucoma, presented themselves. One, aged 74, a night watchman at the docks, says he lost the sight of the right eye four years ago, and the left has been failing rapidly of late. Both present the usual signs of painless chronic Glaucoma, T = 3 +, media clear, cupped discs, &c. No perception in

right, doubtful in left. On December 12th, I performed hyposcleral cyclotomy on right; the pupil at once dilated towards the wound, and then gradually all round. On the 13th, T.n, pupil medium size. He then became home-sick, fretful and unmanageable; refused his food, took off his bandage, and wandered about the hospital, with the result of getting slight iritis. He was sent home on the 21st, and two days after came back free from iritis, and with eye of normal tension. Unfortunately, on account of much sickness in his home, treatment of the left eye was deferred until January 17th, by which time sight was extinct. Cyclotomy was performed with the same result, tension becoming normal, but there was no restoration of vision.

The other patient had chronic Glaucoma of left eye, with much pain for about twelve months. T almost 3 +, mere perception of light, media hazy, disc cupped. Cyclotomy was attempted on him, but not performed, on December

12th. As soon as the knife pierced the iris, he started, and it was withdrawn without any division of the ciliary muscle. There was hæmorrhage into the anterior chamber, and a bead of vitreous kept the wound open for some days, *during which time the tension was kept low by mere drainage; nevertheless, the blood was not absorbed.* When the wound healed, the tension began to rise, and on the 27th it was as great as at first. He was therefore etherized, and Cyclotomy was performed. On the 30th, there was less blood, and tension was normal. On the 7th of January, blood almost, and on the 19th, completely absorbed, with normal tension. There was some opacity in the vitreous, consequent on the first ineffectual operation, probably from some blood finding its way into the vitreous. When the man started, he moved his head sideways, so that the knife must have made a considerable lateral excursion, and broken up a large piece of vitreous, letting in

the blood easily. Of course, I ought to have etherized the man there and then, and repeated the operation; but having had so little experience at the time, I was timid. This shews one way in which an accident can happen; therefore, if a patient do not seem steady enough to stand such a shock as that likely to be caused by a cataract operation, I prefer to give an anæsthetic before performing cyclotomy. The pain, however, is usually so slight that most grown-up people stand it without complaint.

No other case of Glaucoma came before me until March 8th, when a gentleman, Mr. H., aged 71, consulted me. Both eyes were affected with acute Glaucoma. The left had become sightless from an acute inflammatory attack, twenty months before, for which he was leeched and blistered, &c. He said that it—the left—up to this attack had always been better than the right, and, in consequence, he had used it for delicate work, such as examining cloth

with a magnifying glass. He is a retired manufacturer. From the description, the disease was evidently acute Glaucoma. Although sight is now absolutely extinct, there is life enough in the eye to shew all the symptoms of acute Glaucoma. The pupil somewhat dilated, no red reflex, eyeball stony-hard, general scleral and conjunctival injection, and steamy cornea. In the right, with the exception that there was a red reflex, and he could make out with difficulty Sn, X L, the same condition obtained. He consented at once to undergo operation, and having lodged him comfortably, I operated on both eyes in the manner before described, first instilling eserine to put the circular ciliary muscle on the stretch. In the right there was distinct dilatation of pupil after the cut, which continued until a little effusion of blood obscured the view, some coming also through the cut. In the left there was no hæmorrhage; the pupil dilated after section, but con-

tracted after outflow of aqueous. Both Cyclotomies were made below. No sensation of cutting a tense ring, as in the first case, was felt. The right eye was dressed with water dressing, the left with wet lint and cotton wool. No pain followed in left, but rather sharply in right; in four hours this had completely gone, and was succeeded by a numbness. March 9th. Says he has had no pain since last night. March 10th. Right opened in dim light, iris visible, pupil contracted, some trace of blood in lower part of chamber; says he sees better than when he came, T$\frac{1}{2}$ +. Left somewhat reddened, T$\frac{1}{2}$ +. March 11th. Found sitting up giving instructions to his farm bailiff; has had no pain, and slept well.

March 12th. Found fretting on account of some domestic matter. Right pupil dilated; all blood gone from anterior chamber; says he can see better; scarcely any redness in this eye, but there is some in left. March 15th. With 6 +, read

Sn 2½ Tn. Unfortunately, through some misapprehension of my directions, he took off his bandage early the next day, and when I saw him on the 17th, he said, after having the bandage off three hours, he found his sight growing worse; the tension was then above normal, and, as I thought he was somewhat homesick, I sent him home for a day or two, but he stopped ten days, and only came back then through an urgent letter from me. I found he had no pain whilst at home,* but V had sunk to 6½ Sn, with 5 +, and tension = 2 +. After waiting two days, and finding that the tension was increasing, and that he could not see even so well as he did on the 17th, I examined the eye closely, and found, underneath the conjunctival redness, the pale pink injection denoting a return of cyclitis; this, after the first operation, had become

* If Glaucoma recur after Cyclotomy it is always of painless or nearly painless character. It is therefore necessary to keep a patient under close watch for some time, and to test the tension and visual power frequently.

of a slate colour. I therefore again operated, this time exactly opposite to the first cut. The pupil dilated towards the cut, remaining contracted elsewhere, so that it was pippin-shaped. No fluid, either aqueous or blood, followed the withdrawal of the knife, and the tension of the globe, taken carefully twice after the operation, was the same as before. The pink injection of the ciliary region paled into a slate colour whilst the patient was on the table. This, therefore, seemed to be a crucial test of the efficacy of the operation. If the theory be correct that the cure of the faulty process consists in the enforced rest of the ciliary muscle, coupled with relief to the inflammatory tension of the muscle, and not to an adventitious relief of tension from the tapping of the eye, one would expect to find in this case decrease of tension, as soon as time had been given for the rest to have play. And such was the result. The patient was not seen till after an

interval of forty-four hours, during which time he was quite free from pain.

During the operation, which was performed without an anæsthetic, he seemed to suffer more than before; but the mingled numbness and smarting following the cyclotomy lasted only half-an-hour.

On examination, tension was found to be normal, and the patient exclaimed, spontaneously, that he could see better than at any time since the onset of the attack. Vision was not tested with glasses; but, from the description given by him, we may safely take it that it was at least as good as on the sixth day following the operation, when, as above stated, he could, with 5 +, read $2\frac{1}{2}$. April 2nd. Tn, slight conjunctival redness in neighbourhood of incision only.

April 5th. The cause of there being no outflow of aqueous at the withdrawal of the knife is now apparent; a black dot in the wound shewing a minute prolapse of the iris. He strained much during

the operation, and lest he should move and cause crushing of the vitreous, I withdrew the knife hastily. In spite of this, with 6 +, he reads easily 2 Sn, and imperfectly $1\frac{1}{2}$; with 14 + v = $\frac{13}{30}$. April 10th. Went home able to read $1\frac{1}{2}$ readily, and in the September following, I found his vision equally acute; and still later on, in December, I found the above acuteness of vision maintained. I found, also, at the end of September, 1878, that he continued to see as well as at last report.

The next case with which I had to deal was one in which no hope of restoration of sight could be had, and I only operated in order to see what effect Hyposcleral Cyclotomy could have on eyes without any perception of light. A farm labourer, from Gobowen, was sent to me on the 11th of May, 1877. I found in neither eye had he perception. He said the disease began about four years ago, and, after long treatment in two hospitals in the Midland Counties, he

had undergone operation in one, but with no benefit to sight. A large Iridectomy had been performed. The other eye is stony hard; reflex reddish; media very hazy. Cyclotomy was performed, and a very large hæmorrhage followed; but by keeping the wound open there was only slight bleeding into the anterior chamber, and, as far as could be ascertained, none into vitreous. The tension, however, began again to rise, after being normal for some time, and I repeated the operation on June 19th. On July 3rd it is noted that tension was normal, but there was a little blood in the chamber. He left the hospital soon afterwards with normal tension. The object I had in operating on a blind, painless eye was accomplished, for I satisfied myself that it could be done without necessarily worsening an eye even so degenerate as this, and confirmed me in the belief of its value in less damaged organs.

The next case was in a man of 54

afflicted with double chronic Glaucoma. In one eye only was there perception. Cyclotomy was performed, or, rather, attempted, in both, for it was doubted at the time whether the ciliary body in the better eye had been cut, as there was no dilatation of pupil, and on June 19th the operation was repeated. On July 3rd tension was normal, and he left the hospital with fair perception.

The following is the only case in which I have had anything which could be termed disaster; and the history, I think, will shew nothing against the operation.

Mrs. S., aged 38, an umbrella maker, and therefore exercised much in sewing, applied June 19th, 1877. Right eye had absolutely no perception. T 3 + lens cataractous; iris atrophied; sclerotic blue, and traversed by very large veins. She said she had "shocking pain" in it four and a half years ago, but two years ago she could "see across the street with it." She applies because the left

is failing. She has had iritis in this, and now has posterior synechia. I told her there was nothing for it but to remove the right eye, but she was unwilling to have this done. I therefore performed Cyclotomy on it next day. She said the operation had relieved the other eye, but in a few days after she complained of pain in it, and finding the right tender, and below the normal tension, I urged the necessity of removal, to which she consented. I found, as I expected, subretinal hæmorrhage, *and complete atrophy of the ciliary body*. I do not recommend the operation, except as a temporary expedient for such as these; and, indeed, I only did it in this hopeless instance to see what could happen. In this no hæmorrhage followed the withdrawal of the knife.

In the patient from Gobowen, a case parallel to this, save that the lens was not completely opaque, though the vitreous was, bleeding to the extent of half-an-ounce

took place. In the case of Mrs. S., the bleeding took place also, but unfortunately under the retina.

The next two cases shew the value of Cyclotomy in Glaucoma caused by the irritation of long-standing cataract. In such I only suggest it as a means of relieving present pain, and giving the eye time to recover from the inflammation, and so afford a better chance for the operation of extraction.

An engineer had, after repeated blows on the right eye, cataract, and applied because the other eye was becoming affected. The right eye was stony hard, and of course quite blind. Cyclotomy was performed, the tension became normal, and remained so for several weeks, when it again began to rise. I therefore removed the lens by lower flap extraction. The vitreous was fluid, and of course the eye collapsed; nevertheless, the wound healed readily, and a sightly, though sightless, eye was left. It was found that the retina was wholly detached.

On the 25th of June, a widow, aged 45,—whom I had seen for some other ailment a few months before, when I advised the extraction of a cataract from one of her eyes, which she refused to undergo, as she was suffering from aortic aneurism,—asked for relief from agonizing pain in the same eye, which now presented all the symptoms of acute Glaucoma, stony hardness, dilated pupil, dull ciliary redness, &c., but still she had fair perception. Cyclotomy was performed at once, and next day she reported pain was relieved very soon after the operation, and she was then comfortable, T = + 1. On the 5th of July, tension was normal, and there was a mere faint trace of redness in the neighbourhood of the site of the wound. She went out soon after, with the warning that if she did not have the cataract removed, the disease would return. Some months afterwards, finding she did not visit the hospital as she had promised, I sought her out, and found that the eye was again hardening,

and there was some ciliary redness. But, as there was no pain, she refused further interference.

A case which illustrates the value of Cyclotomy in Glaucoma, occurring in eyes affected with chronic syphilitic inflammation, was noticed on the 5th of September. Esther Carson, who had been some time under my care for this affection, had complained repeatedly of the right eye being worse than the left, although the cornea was clearer, and the iris less adherent to the lens than in the left eye. My suspicions were not aroused until this day, when, on testing the tension, I found it to be almost 3 +. I performed Cyclotomy at once, with the usual result, and on the 13th it is reported "perfect success." She has since been under observation until very lately; there has been no return of the Glaucoma, and the condition of both eyes has been gradually improved under the ordinary treatment for syphilis.

On July 16th, 1878, I operated on three

cases similar to this; in one a woman, aged 47, with acquired syphilis, T 1 +, cornea occupied by large central opaque yellowish-white patch, ciliary injection, bare perception, and much pain. Cyclotomy relieved her at once. Next day that part of the cornea round the central patch was clear, and perception greatly improved.

The second case, a sailor, with congenital syphilitic ophthalmitis, cornea steamy, T 1 +, bare perception, and much pain. Cyclotomy, with similar result.

The third case, a girl, aged 12, cornea covered with fine red vessels, otherwise similar to last, with same result. All these cases ultimately did well.

On October 6th, John Batterbee, aged 70, a tinman, applied, and I found in right T 3 +, no perception; left T 2 +, V = $\frac{10}{200}$. He states that nine years ago the sight began to grow dim, with pain of rheumatic character in eye and same side of head, and that he found the sight quite extinct about nine months before; the disc pre-

sents a well marked cup. In the left there is some suspicion of cupping below, and also a crescent. On October 9th, Cyclotomy was performed on both, and the eyes were treated with the precautions, as to rest, &c., which experience had suggested.

Tension was found to be normal in both, two days after the operation, and gradually light was admitted to the eyes. In a few days after, I was rather surprised to find him reading a newspaper, with glasses, and cautioned him, but as no harm resulted, he was allowed to take his own course, which he did with some judgment, and on the 31st of the same month he was discharged at his own request, "able," to use his own words, "to see as well as ever I did." This, of course, applies to the left eye only. I am sorry to say that my notes do not shew his exact vision for distance, but he could read 1½ Sn readily, with glasses suited to his presbyopia.

As I have not since heard from him, I conclude that he has kept well.

The next case is one which shews the value of Hyposcleral Cyclotomy in more ways than one, namely, that it is a complete cure for the disease; and that if, unfortunately, from any cause the disease should recur, the operation can be repeated without delay, and without injury to the eye.

A tradesman, Mr. I., aged 33, belonging to a firm of ropemakers in this town, consulted me on the 12th January, 1878. He complained of failing sight and pains in eyes and temples, and dated these symptoms from about two years ago, when, after being hurt internally, he began to find his eyes dim and painful at night, both of which symptoms have increased greatly in last three or four months. He wears 14 in. convex glasses continually, and he says he has worn spectacles from childhood, his eyes having been always weak, and unable to bear strong light without inconvenience.

As these symptoms were attributed to overtaxed accommodation in a highly hypermetropic eye, atropine was instilled in the left eye,—of which he complained the more,—in order to estimate the refraction. The discs shewed the usual signs of an overworked hypermetropic eye, namely, those of congestion.

On the next night he was seized with violent pain, and the day after, being seen by someone else in my absence, he had again atropine instilled repeatedly, the eye, after this, soon shewing intense inflammation. On the 15th, the pain had greatly increased after these instillations, which had been again used three times on this forenoon, and at 2 p.m. I found the eye was the subject of intense acute Glaucoma; pupil widely dilated; great scleral injection; and pain amounting to agony. T 3 + and V = $\frac{1}{100}$. I performed Cyclotomy at once; *the division of the ciliary muscle giving the same sensation to my hand as one would expect from the cutting of the tendo*

*achillis of an infant.* The patient was quite conscious of the act, and indeed said he had heard it.

When I say that the eye required a glass of 7 + for distance, and that, therefore, the ciliary muscle must have had a corresponding development, this statement will not seem so incredible.

Tension, after operation, was quite 2 +, as very little fluid came out on the withdrawal of the knife, and no blood.

In order to put the ciliary muscle on the stretch, and so ensure its thorough division, eserine sulphate was instilled three times before operating, but no contraction of the pupil was caused thereby.

The terrible aching gave way, after operation, to acute smarting pain, which, he said, was not much to be preferred to the aching; but it speedily abated, and was quite gone by evening. The eye was treated with water dressing, and, unfortunately, by mistake, again with

atropine. There seemed to be a fate in this case. The disease was evidently started by the first instillation of my own; was made fulminating by the repetitions on the 13th and 14th; and now the nurse having forgot—after the long time since the last case was treated—that atropine was strictly forbidden in such cases, applied it here. I found it out on the 16th, and stopped it at once. The patient at this time said he saw much better. On the next morning, however, he awoke up, found he had pulled his bandage off, and that the eye was painful, and at my visit he said he could not see quite so well as yesterday. On the 18th, the tension had risen considerably, and his vision had worsened in proportion; so, losing no time, I again performed Cyclotomy, previously using eserine. The pupil dilated immediately after the operation, but soon contracted under the influence of the eserine. Smarting pain followed, and continued till evening. There was slight bleeding

this time, and the tension was 1 + after the operation.

On 19th, no pain; on 21st, the eye was still rather harder than right; but, on 22nd, scarcely perceptibly so, and sees better when tried very cautiously in dark room. On 23rd, tension quite normal; and on the 25th, there was no ciliary redness, and he said, "I see finely."

Later on it was found that the right required 7 + for distance, and with this V = $\frac{12}{30}$, and with 5 reads 1$\frac{1}{2}$.

I shall allude later on to this case, in treating of the causation of Glaucoma, and will now only ask the reader to contrast the state of this eye, after two Cyclotomies, with Mr. Higgens's case of double Iridectomy. After double Cyclotomy, the eye still intact; after double Iridectomy, devoid of more than half the iris, if the operation be done according to the strict canon.*

* Having seen, since this was written, a lady in one of whose eyes double Iridectomy had been performed, I find I ought to have said

Of course such an eye required much nursing afterwards, as indeed did its fellow, the right eye. On the 6th of March, he complained of some aching in both towards evening, and for this a neutral solution of muriate of morphia, gr. iv. ad. ʒi, was prescribed for instillation. This, used at first two or three times, and afterwards more frequently, gradually reduced the unfavourable symptoms; and now, writing in July, I find the eye has maintained the acuteness above mentioned.

A very pleasant, polite, insincere, and drunken old Irish woman, E. D., aged 60, was my next Glaucomatous patient. She

"devoid of seven-eighths of the iris," for there was the merest crescentic rim of iris on the outer and inner side of the eye,—the Iridectomies had been done first upwards and then downwards. Both operations had been very well done, seeing that there were no signs of either incision in the Sclerotic. This eye was totally blind. On the other eye Sclerotomy had been performed with the result of causing a huge staphyloma of the iris, so that the upper lid was greatly bulged. An Iridectomy below had also been performed, according to the patient's statement, after the Sclerotomy, on account of the failure of the latter operation. She could read large type with this eye, but it was extremely irritable, and I scarcely thought it likely she would retain long much power of vision.

had applied to me about three months before, when I found one eye had been quite destroyed by injury many years before, and the other was the seat of acute Glaucoma. I told her that an operation was necessary for her relief, and she assented, saying she would come next day, but from her manner I thought she would not do so; and, noting her address, I called on her, as she did not come to the hospital. To my intense surprise, I found all trace of Glaucoma had disappeared; the eye was quite free from redness, was of normal tension, and she said her vision was as good as ever. I have called her very polite, and I have good reason. Every surgeon acquainted with the usual manner of hospital patients can imagine, under such circumstances, what I might have expected; but this old lady thanked me for my consideration in going to see her, and did not triumph over my discomfiture. I took the lesson well to heart. I saw that there was

another force which could paralyze the ciliary muscle and cure Glaucoma, besides Cyclotomy and Iridectomy, and that was *fright*. The old lady afterwards told me that she was in a perfect terror at the idea of an operation, and that, under the influence of this terror, the symptoms gradually subsided.

Later on, however, terror no longer stood her friend, for on the 12th of Feb. she again applied, for the same symptoms, and this time she submitted willingly enough to the operation, which was done next day. T 3 +, mere perception, dilated pupil, etc., were noted before the operation. On the 14th, she was free from pain, and tension was normal. On the 17th, she could tell time by watch; and on the 23rd, media were almost quite free from haziness, and with 8 + she read $4\frac{1}{2}$. On the 26th, having, with the matron, made an excursion amongst the trial lenses, she found that, with a 16 concavo-cylindrical lens, V=$\frac{13}{40}$. A day or two after this, although warned that

she was not well, and would yet require care, she left the hospital, and I heard of her exploits only rarely. One report was that she had, shortly before being under my care, received a legacy of £150, which she and her friends speedily drank; and that, after leaving the hospital, she was enjoying herself in like manner with some little windfall. And then came another, that her husband had been met by one of the nurses, and he had informed the nurse that I had deprived his wife of what little sight she had left. This was somewhat trying; but, fortunately for me, she had only one eye, and finding the alcoholic treatment of Glaucoma, though it gave relief to pain for the time, did not give sight, she again came to me on the 20th of March, when I found the same signs as before, except that she had less pain. Of course I told her she would have to undergo the same treatment, and urged her to enter the hospital at once, but, equally of course, she had some

excuse, and left, and I did not see her until April 9th, when I found the eye stony hard, and with very doubtful perception, cornea steamy, and hazy vitreous. I attempted Cyclotomy, but, owing to the unsuitability of the knife, I did not accomplish the division of the ciliary muscle, and so operated on the 11th; this time with perfect success, the tension becoming normal directly, and keeping so. On the 20th, the disc was made out, and I find I made this despairing note, "*Now, alas! shewing the characteristic cup.*" There was no mistake about this, nor about what I now relate, however incredible it may seem. There was a distinct cup on the 20th day of April, the vessels being pressed out of sight behind the edge of the sclerotic, and I had scarcely any hope that useful sight could be restored; the patient also, having had a full faith in the magical effect of the first operation, finding her sight scarcely the better of the second, was

correspondingly depressed. However, experience in another class of cases had taught me not to despair of restoring the activity of nerves not too much wasted. She had, at this time, mere perception, which even was evanescent. She was able to distinguish daylight only for a time, and then the ability would vanish, and only come back after a rest. I ordered the cautious instillation of a solution of strychnine sulphate, gr. iv. ad. ʒ; and then, as I found she could tolerate it, increased the frequency of the droppings. On May 8th, I had the great delight of finding that *the cupping of the disc had almost disappeared;* indeed, had I not been well aware of the previous presence of it, I should have ignored the little evidence there remained; nevertheless, one vessel had a distinct elbow. I felt sure, in consequence of this, that the patient's sight had improved greatly, although she affirmed it was bad; but I found she was comparing her present vision with that after

the first operation, and on giving her 10 + she managed to make out 30 Sn, and was going on to 20, when I stopped her, fearing some damage. I am sorry to say that, though I have succeeded in keeping down the glaucomatous symptoms, I have not succeeded in restoring the sight. The disc now—September, 1878—is not cupped, but she can only distinguish large objects. She has improved somewhat lately, and is still under treatment. She has in the fellow orbit an eye wasted from old injury: as it was quite free from irritation I left it alone, but I am doubtful that I did right. The more I see of such wasted eyes, the more reason I have for believing that they exercise a baleful influence on the fellow-eye, and if a similar case present itself to me, I shall remove the wasted eye before operating on the Glaucoma.

A case of acute Glaucoma, caused by the irritation of a cataractous lens, presented itself on August 27th, 1878. An engineer of a river steamer stated that he received,

fourteen years ago, a blow on the left eye; that the sight gradually failed, but the organ gave him no further trouble until the last few days, when pain set in and became agonizing. The eye presented the usual signs of acute Glaucoma, tension being 3+., with this in addition,—the pupil was obstructed by a grey opaque body. At first he denied having perception, but on more careful trial I found he had it distinctly, and performed Cyclotomy, keeping the knife in the wound for some seconds, to allow free escape of blood and aqueous, and then drew it out very slowly, to be secure against prolapse of iris. As I did so, the lens, now seen to be thin and atrophied, rotated on its horizontal axis, leaving the upper half of the pupil free. He at once exclaimed, "I can see the window and your face." Next day I found he had no pain, and the degree of sight was maintained. The eye improved, so that he left the hospital in a week; then, as I was away from

home, I did not see him for a fortnight, when I found the whole of the pupil clear and normal tension. He had, a few days after leaving the hospital, some pain, from which the instillation of atropine had speedily relieved him ; probably this was due to cold, as he resumed his work on the river. The shrivelled lens was only just visible, far behind the iris, on the temporal side, and, beyond a few shreds of the ligament of the lens, there was no pupillary obstruction. I take it that the Glaucoma was caused by the tension of the ligament of the lens. The long-continued phakitis had caused such contraction of the lens capsule as to make the ligament exceedingly tense. How tense is shown by the fact that when this tension was relieved, probably by rupture, the remains were tucked almost out of sight behind the ciliary processes. With $2\frac{1}{2}$ and $3\frac{1}{2}$ cataract glasses he had vision as good as the average after extraction.

A case shewing the value of Cyclo-

tomy in acute Glaucoma supervening quickly on dislocation of the lens is now under my care. A stout Irishwoman, aged 49, was struck by a man's fist in the right eye on the 19th of October. On the 8th of November she came to me, when I recognized rupture of the ligament below, so that the lens could swing backwards and forwards against the iris. The other signs were those of acute Glaucoma; T = 3+, with very faint perception. Pain had been agonizing. I attempted Cyclotomy, but, owing to her restlessness, failed to do it. She was treated with eserine without good effect, the tension keeping up. On the 13th I tried again, and though this time she was still more restless, I succeeded, the tension remaining barely above normal, and the general injection of the eye going down with a total absence of pain. It would be perhaps too much to hope for complete relief until the lens is removed, but I operated in the hope that the eye

might perhaps become habituated to the moving of the lens, and the latter not require removal, but, at any rate, there will be a greater chance of recovery from the operation of extraction, after even a temporary relief from Glaucoma, than during an attack.*

The following cases will shew that I am not blindly wedded to Cyclotomy, and do not perform it where other measures seem to be indicated.

A woman, aged 39, came to me November 22nd. Her left eye was wasted from injury long ago; her right had the lens cataractous, and dislocated into the anterior chamber, so that the lower edge was in front of the lower part of the iris, and the upper edge behind the upper part of the iris: T = 3+, perception doubtful, pain acute. I transfixed cornea, lens and all, with a narrow

* On accouut of tension again increasing, I removed the lens at the end of January: although some vitreous was necessarily lost, I have no doubt she will have a useful eye.

knife, made a flap below, and removed the lens without any difficulty; the vitreous bulged, but there was no rupture of the hyaloid membrane at the time. But afterwards, unfortunately, this did occur, and some vitreous was lost, with the result of the iris being engaged in the wound. Eserine, however, prevented its prolapse, and the wound is now—three weeks after the operation—nearly healed, and sight has improved considerably. I have every hope that she will have a very useful eye.

A gentleman, aged 35, arduously engaged in a large business, which necessitated frequent and long journeys, came under my care for Keratitis. This yielded speedily to ordinary treatment, but recurred again and again on exposure to cold. During some of these attacks I suspected the complication of Glaucoma, as he told me that the sight of the eye sometimes became extinct; but I never was present, to note

the increase of tension, until the last—the fifth—attack. He had got almost well of the fourth, and ventured on the river on a bright day, with the eye well defended; but next day the worst attack of all came on. This time I found T = 3+, bare perception, intense pain, and the other usual symptoms of Glaucoma, together with three keratitic foci. I neither performed Cyclotomy nor Iridectomy, but recognizing the fact that in these three keratitic foci lay the cause of the Glaucoma, cut each across, fortunately losing no aqueous until the third incision was completed, so that I had no difficulty in getting through the cornea in the second and third cuts. The glaucomatous pain ceased at once, but was replaced by smarting, which was more severe and lasted longer than I have seen after Cyclotomy. But recovery was uninterrupted aft erthis, and the eye became equal to its fellow.

## CHAPTER III.

Now that I have shewn conclusively, to my own mind at least, and, as I hope, to all unbiassed readers of the foregoing, that in Hyposcleral Cyclotomy we have a sure remedy for Glaucoma and its allies, it remains for me to discuss its mode of action. I shall endeavour to shew that it, as well as all the methods of treating the disease in question which have proved themselves at all efficient, acts by producing, firstly, immediate relief to tension and infiltration, and, for a time, compulsory rest, of the ciliary muscle. Incidental to the description of this mode of the action of the various operations, I shall enunciate a theory of the proximate cause of Glaucoma, which, I think, tallies with all the known phenomena, and

explains some things up to this time inexplicable.

But, before proceeding to explain what I think is the true theory of the causation and cure of Glaucoma, it is necessary for me to state that I assume as correct the theory of accommodation described by Warlomont in the *Annales d'Oculistique* for May, 1875. Shortly, the theory is as follows. The lens, in a state of rest, as in a dead body or during sleep, assumes the most extreme* convexity it is capable of; that, in the normal eye, for distant vision, it is flattened by the pressure, on its anterior face, of the ligament of the lens; that this ligament of the lens is tightened, and the lens thereby further flattened by the action of the *radial* fibres of the ciliary muscle; that the ligament is slackened, and the lens thereby rounded by the action of the *circular* fibres of the ciliary muscle. That

* On theoretical grounds I should be disposed to qualify this, and instead of "most extreme," &c., would read "a greater degree of convexity than exists when the eye is at rest in waking hours."

is, we have the radial fibres opposed by the circular, and the elasticity of the lens opposed by that of the ligament. *

Until lately it has been assumed that accommodation for distance is passive, and this has been the longer unquestioned, in all probability, owing to the fact that Donders has given to the theory his high sanction. But, apart from local anatomical considerations, to assume that accommodation for distance is passive, is to assume for the eye a scheme of muscular action against all analogy. Where do we find in the body a single set of muscles without an antagonistic set? And again, a physiological experiment which anyone, hypermetropic, or emetropic if such exist, can perform with little trouble, will shew that accommodation for a far point is under voluntary control just as much as for a near

* For a good description of the muscle and its action, a reader cannot do better than study this lucid essay. A fuller account of the anatomy of the two sets of fibres is to be found in the 3rd volume of Stricker's *Handbook*.

point. Perhaps other investigators have discovered it; but, as I have not yet come across any account of it, I will narrate how I happened to find it out.

Some time ago, being anxious to become practically acquainted with the effects of mydriatics and myotics on myself, I applied a solution of daturine three or four times to my left eye, which is slightly hypermetropic. When the full effect of the mydriatic was manifest, I applied a solution of eserine until the pupil was contracted to a pin's point, and distinct vision became possible only for objects from four to six inches from the eye, *without effort*. But on gazing at an object thirty feet off, I found by a strong effort, which was followed by aching pain, I could get distinct vision for objects at that distance, but for a few seconds only, and that I had to wait some time, doubtless for the radial ciliary muscle to rest and recover itself, before being able to repeat the act. I tried

this again and again, in order to be quite certain as to the fact.*

In this, the second part of my Essay, I shall, as in the first part, follow what I may term the historical method, and describe the steps whereby I was led to formulate my theory.

In thinking out the result of my first operation, I reasoned thus. Here a perfectly typical case of acute simple Glaucoma is aggravated by atropine, and cured by simple section of the ciliary muscle. Now, the obvious and immediate effect of section of a muscle is to produce temporary paralysis of it :† conversely, if

* I have tried the experiment again myself, that is with eserine, but without previously using atropine or daturine, and found the same result ; also, I have tried it on a young woman, intelligent enough, but quite ignorant of physiology ; and, finally, I induced a young medical friend, deeply imbued with the ordinary lessons of book physiology, and therefore very sceptical of this teaching, to try the effect of eserine on his own eye. Both the young lady and the young doctor found that it was possible to accommodate for distance at will, though of course with much effort. If this be true, is it possible to dispute the statement that accommodation for distance is a voluntary muscular action ?

† Section of the circular ciliary muscle produces a greater

by producing temporary paralysis of the ciliary muscle one can cure Glaucoma, it seems to follow logically that excessive use of the ciliary muscle may and does produce Glaucoma. And this is what I venture to put forward as the true theory of the causation of simple Glaucoma,* whether acute, sub-acute, or chronic.

In nearly every case of simple Glaucoma the eye is hypermetropic, often highly

degree of paralysis, and a longer continuance of the paralysis than would be *a priori* imagined. I have under my care at this time (January, 1879), a man who, in April last year, was wounded by a flying chip of steel in the exact spot which I choose for hyposcleral cyclotomy. The wound was quite healed when I first saw him, and he came on account of the embarrassment to his sight. I found the pupil dilated, and vision for distance impaired, but the most notable effect was that near accommodation was quite withdrawn from the control of the will. Eserine contracted the pupil and improved near vision, but in spite of its use for months, near accommodation seems as far from being under voluntary power as ever. Sight on the whole is sharpened considerably, but this is due to the clearing up of the media, and recovery of the retina from the shock which resulted, in addition to the muscular paresis, from the rough handling the eye received from the sudden entrance of a blunt piece of metal.

* By the term "simple Glaucoma," I mean that form which comes on in an eye previously healthy, that is, without cataract, dislocation of lens, anterior synechia, etc.

so; and, as I shall explain later on, in those very rare cases of myopia in which it occurs, it may safely be assumed that the eye was originally hypermetropic, but became myopic by the same vicious action which, otherwise influenced, may bring on Glaucoma.

Now, in a hypermetropic eye, in direct proportion to the degree of the deficiency of refraction, so is the excessive action of the circular ciliary muscle. For the seeing even of the most distant objects it is called into play, and in persons employed in sedentary occupations requiring the constant use of close vision, a class in which most cases of Glaucoma are found, we have it that the ciliary muscle is in constant strain during waking moments, and only comparatively at rest during sleep; and just as a tired and overwrought brain further tires and overworks itself during sleep by dismal dreams, out of which it awakes unrefreshed, so there can be no doubt the ciliary muscle may

keep up its vicious action during sleep.* Herein may lie the explanation why so many hypermetropes complain more of ocular fatigue in the morning than in the evening.

I believe what takes place, therefore, in Glaucoma is as follows. The long-continued overaction of the ciliary muscle begets in it an irritable state, which only wants some provocation to develop an active inflammation. Such provocation is given typically by atropine, which since it excites the radial fibres to drag on the congested and irritated circular muscle, offers the most direct means of provoking the disease. Thus the mystery which has enshrouded the action of atropine, in

* In saying this I do not ignore what I have said about the lens ordinarily assuming greater convexity during sleep; what I mean here is, that there may be such spasm in the circular fibres, caused by overwork, as there is in the radial when excited by atropine. We all are well aware that after paralysis of the third nerve the pupil is far less dilated than when, with no such paralysis, the sympathetic is stimulated by atropine. Similarly, the state of balance, or tone, which normally exists between the radial and circular fibres may be disturbed by the continuance of the vicious action of the circular during sleep.

inducing or intensifying Glaucoma, is easily explained.

And, of course, it is quite possible that the radial fibres are in a similarly explosive state as well, seeing that they have been dragged on unduly during the period wherein the circular have been overacting.

And here it is right to mention the question of the use of eserine, in the treatment of Glaucoma. I have seen that it has been proposed to use it for this disease, doubtless under the idea that, as atropine will bring on acute Glaucoma, its antidote, eserine, will cure it. I think the preceding observations have pointed out the fallacy of such reasoning ; indeed, I doubt very much whether it matters which muscle begins the game, the effect will be the same. But, apart from supposition, several times I have used eserine before performing Cyclotomy for acute Glaucoma, in order to put the circular muscle on the stretch, and render the

cutting of it easy. Each time the pain has been greatly aggravated, if time have been allowed, before operating, for the action of the drug to be induced;—and the after-pains also. What is wanted to cure acute Glaucoma is rest, perfect and profound, and this, I maintain, can be obtained in no way comparable to that of Cyclotomy.*

I think, now, it is shewn to be plausible, at any rate, I am perfectly satisfied in my own mind that it is so, that the foregoing is the way in which the inflammation of Glaucoma is caused, for I hold all Glaucoma to be inflammatory, no matter how chronic or painless. It is held by some that inflammation is a mere concomitant of Glaucoma, but I believe it to be of its very essence. I take it that even when a patient asserts positively that his eye has gone blind painlessly, he will

* I wish to call attention to the fact that I am here speaking of acute Glaucoma only, and of its initial treatment. Of its secondary treatment, and of the treatment of chronic Glaucoma by the aid of eserine, I shall speak in a later chapter.

tell a different tale after he has been operated upon.

And, in speaking of pain, one ought always to remember that what is acute pain to one is a trifling inconvenience to another. Besides, a disease which, if packed into the space of a few hours, causes maddening pain and the other concomitants of acute inflammation, will, if spread over a period of months, or perhaps years, become so diluted that the pain, redness, etc., will be almost unnoticed, and it will require a practised hand to detect any increase of the tension.

Of course there are all grades between these two extremes; but I take this ground with the greatest confidence, that all Glaucoma is caused by inflammation of the ciliary body. And it now remains, therefore, for me to connect this inflammation with that increase of tension which is the immediate cause of the blindness of Glaucoma. This has been long a mystery, but I think it is so no longer.

This, the remainder of my task, is easy, if we accept Schwalbe's theory of the lymph-paths of the eye, as put forth by him in Stricker's *Histology*, vol. iii., Sydenham Society's translation. He says that "The anterior chamber of the eye is a general receptacle for the lymph coming from the iris and ciliary processes, which flows into it at two points, from the canal of Petit, through the capillary fissure between the pupillary border of the iris and the anterior surface of the lens, and from the ciliary body through the spaces between the trabeculæ of the ligamentum pectinatum. The canal of Schlemm is the way of exit of the lymph of the anterior chamber, with which cavity it communicates by means of a system of fine fissures, which occur between the elastic circular fibres and fenestrated membranes, which extend from the margin of the membrane of Descemet, and form a modified prolongation of this membrane as far as to the posterior point of inser-

tion of the ciliary muscle, and are continuous with the trabecular meshwork of the canal of Fontana. This peculiar tissue bridges over a groove situated on the inside of the anterior border of the sclerotic, where it joins the cornea, and converts this groove into a lacuniform circular canal, which is, in fact, the canal of Schlemm. The manner in which the canal of Schlemm is connected with the veins in its vicinity is still unknown.

In all probability, certain valvular arrangements exist, which prevent the passage of venous blood into the canal of Schlemm under the normal conditions of pressure. If we consider what the consequences would be if the anterior chamber of the eye were to have in the lymphatics its proper discharge-pipes, we shall readily understand the meaning of the above-described relations. Were the lymphatics the discharge-pipes of the aqueous humour, it would be clearly impossible to preserve the relatively con-

siderable pressure which exists in the anterior chamber of the eye, since, with the low pressure of the fluids contained in the lymphatics, a rapid discharge of the aqueous humour would occur, which could not be compensated for by the transudation of fresh fluid through the walls of the vessels, and the anterior chamber would collapse. This, however, is avoided by the opening of the lymphatics into the veins, through the intervention of the canal of Schlemm.

Thus, owing to the circumstance that in the small veins the pressure is considerably higher than in the corresponding lymphatics; and further, owing to the resistance which the fluids have to overcome in their passage from the anterior chamber of the eye to the canal of Schlemm, in the narrow system of fissures, it becomes possible for the pressure in the anterior chamber of the eye to be preserved at its normal height, and for the entrance and discharge of fluid to be equalized.

Now, if it be true that the aqueous humour, when it has done its work, escapes through these passages into Schlemm's canal, we have only to suppose that through the inflammation of the ciliary body, whether it be slow or quick, these discharge-pipes are obstructed, and we can understand how increased tension takes place. In ascribing this important effect to the obstruction of the lymph from the anterior and posterior chambers of the eye, I am not forgetting that the supra-choroidal lymph-space may play a considerable part in the changes which take place in Glaucoma, but as it is not made out so plainly how obstruction can take place in the lymph-path surrounding the venæ vorticosæ, which are the discharge-pipes for the posterior lymph system, and as increase of fluid in the aqueous chambers is quite sufficient to account for any degree of increased tension of the globe, I am content for the present to leave the influence of the supra-choroidal space for further investigation.

## CHAPTER IV.

I HAVE now to account for the undoubted curative action which Iridectomy has on, at any rate, Acute Glaucoma. I have said, and here repeat it, that Iridectomy acts like Cyclotomy, by relieving tension in the inflamed ciliary muscle, and inducing its compulsory rest. The two operations are so very different, that at first sight one would think they must have very different actions, and this struck me at once after the success of my first operation. But whilst considering this, I became conscious of an idea which I had floating in my mind years before, when I was more amongst general surgery than I am now. It was this, that an incision bearing some reasonable proportion in length to the muscle concerned, made through the skin, etc., in the neighbour-

hood of a muscle, but not in the muscle, paralyzes for a time, even though it be left untouched by the incision. I had an opportunity of trying whether this was so or not, soon after, in the case of a patient whose femoral artery I had occasion to tie. Three days after the operation, which was done with the least possible disturbance of the tissues, I asked the man if he could straighten the knee, to which he replied he could do so easily. But this he could do only by means of applying the ball of the great toe of the other foot to the heel of the affected limb, and so pushing the leg straight. On preventing this manœuvre, and leaving the limb to itself, I found he had absolutely no power of extension; the limb refused to stir, just as if the extensors were paralyzed, although he could flex the limb as well as ever. He did not complain of the effort to extend the limb causing pain; he merely acknowledged his powerlessness.

Now, if an incision some four inches long can paralyze for several days a muscle of such magnitude as the *quadriceps extensor cruris*, it does not seem strange that an incision through conjunctiva and sclerotic, as in Sclerotomy, and still more, when accompanied with the removal of a corresponding piece of iris, as in Iridectomy, shall produce paralysis of the ciliary muscle for a time.* And it is plain why the effect of Iridectomy is lessened when the incision is made in the cornea; the cut is more distant from the muscle, and is therefore of less influence, and besides, the powerful effect of cutting or tearing off the iris from its junction is wanting, seeing that a rim of iris of such depth as to prevent the removal of that part in close relationship with the ciliary muscle must be left.

* Von Graëfe long ago pointed out that after Iridectomy there is always paralysis of accommodation, by which, of course, he meant paralysis of the circular ciliary muscle.

In discussing the effects of the two operations, and ascribing the cure of Glaucoma to compulsory quiescence of the ciliary muscle, I do not overlook the fact that there is present also the ordinary effect of relief of tension in inflamed parts; but I maintain that the rest of the muscle is the chief element of the cure, for, as I have above shewn, the Glaucomatous symptoms speedily re-appeared when either, as in Mr. H.'s case, the eye was used too soon, and the ciliary muscle so brought into play, or, as in the case of Mr. I., where the ciliary muscle was teased by atropine.

I had got thus far with my deductions as to the cause of the increase of tension in Glaucoma, when my attention was called to the report of the researches of Dr. Brayley and of Dr. Max Knies, in the Ophthalmic Hospital Reports for December, 1877. Briefly stated, these gentlemen found, in a large number of cases, just what I have described in the

case of Mrs. S., whose eye I removed, namely, atrophy of the ciliary body. Dr. Brayley says:—"The *ciliary body* is the seat of the most marked and universal changes occurring in Glaucoma. This atrophy is well seen in all, and almost equally in those cases of short and of long duration, provided that the increase of tension has been great in both. *It affects in particular the circular fibres;* and therefore the antero-internal part of the muscle (with relation to the antero-posterior axis of the globe) is the most wasted, and in consequence of this the muscle, instead of being of its greatest thickness in front, often takes forwards from a point some way behind its anterior border. This affected part in many cases presents no trace of muscular fibres at all, but in most there are a few thinned ones mixed with a little nuclear tissue and some blood vessels. The radial fibres do not escape unaffected. Their bulk is diminished, though to a less

degree than the others. And even this does not represent the full extent of the atrophy, for the fibres left are much thinned, especially those forming the central part of the muscle; and here, frequently, they can scarcely be seen at all. In some specimens this condition exists throughout both sets of fibres, and scarcely a trace of the existence of muscular tissue can be found anywhere."

Here is what I wanted to complete my case. The pathological anatomy of Glaucoma shews that in *Glaucoma absolutum* we have the usual results of inflammation, namely, atrophy of the part affected; and herein lies the explanation why in very far advanced cases of Glaucoma, neither Iridectomy, Cyclotomy, nor any operation whatever can be expected to permanently relieve tension. With complete atrophy of the ciliary body there must be such preceding infiltration and contraction as to obliterate the discharge-

pipes of the aqueous chambers of the eye, and render it hopeless for any operation to afford relief. We come back, therefore, to the old practice, that in case of complete extinction of sight, by Glaucoma, if pain come on, it is best to enucleate at once. If, however, there be any sight left, there is some lymph-path, however small, still left open ; and this brings me to another part of my essay, namely, the effect of Eserine.

## CHAPTER V.

### On the Use of Eserine in Glaucoma.

A case, the course of which seemed at first to involve a paradox, came before me on the 3rd of August, 1878. It was that of the tradesman, Mr. I., who first came on the 12th of the preceding January for acute Glaucoma, and was relieved by Cyclotomy. He states now that the eye (left) has been getting irritable towards night, and that the morphia instillations have lately done no good. I found the tension, though not high, greater than that of the right, and therefore performed Cyclotomy. This gave relief at once, and for some time after; but then the old irritability came on. The instillation of morphia did no good, but that of eserine, gr. iv. ad. ʒj, caused a cessation of all the

symptoms for some time. When, however, there had been no exhibition of eserine for some days, the tension rose, and the other symptoms reappeared; so I ordered a one-grain solution, then half, and then quarter, to be used once daily. This brought up the acuteness far beyond what it was since the attack, and probably before, for after a month's use V = $\frac{12}{20}$ with 7 +, whereas as above mentioned, page 42, at the best, V = $\frac{12}{30}$.

I confess I was much astonished at first by this, for it seemed to militate very considerably against the theory which I have put forward as to the causation of Glaucoma. If this disease be produced by long-continued over-action of the circular ciliary muscle, why should eserine, whose very faculty it is to produce contraction of the ciliary muscle, act as I have described? I was not long, however, in finding the solution to the seeming paradox. It has long been known that after Iridectomy for Glaucoma, accommodation, that

is, the ciliary muscle, is paralyzed. It has been pointed out by Theo. Leber,* that during the contraction of the ciliary muscle the discharge-pipes of the anterior chamber are opened, and consequently, if the muscle be completely paralyzed, or rather, if it will not respond to the ordinary stimulus of the will in the act of accommodation, these discharge-pipes must be less efficiently opened in proportion to the degree of loss of power of the ciliary muscle. But it is well known that when the action of this muscle is quite withdrawn from the influence of the will, it may still be under the influence of eserine. Observations in cases of Cycloplegia of diphtheritic origin have quite satisfied me of this.

What occurred, therefore, in Mr. I.'s case was this. The circular ciliary muscle had been considerably weakened, first by the cyclitis, and then by the cyclotomies,

* In his Essay on the Bloodvessels of the Eye, in Stricker's *Handbook*, vol. iii.

and no longer responded to the ordinary stimulus in accommodation; the discharge-pipes, therefore, were not opened sufficiently or often enough to keep down tension. When, however, eserine was applied, the discharge-pipes were opened, and tension became normal. His sight now (March, 1879) is as good as at last report; he has used a solution of eserine gr. $\frac{1}{16}$ ad ʒj. twice a-day for the last five months; sometimes, however, he has had to use the eighth-grain solution, on account of warning symptoms, which have speedily yielded to the drug.

Consideration of this case led me to believe that I had in eserine a valuable assistant in the treatment of Glaucoma. Iridectomy has long been acknowledged to be not very successful in chronic Glaucoma, and I have confessed above that on theoretical grounds I expected little more from Cyclotomy alone, when the disease was very far advanced. But if the theory, that eserine is capable of opening the

discharge-pipes when the stimulus of the will is no longer able to do so, be correct, then, so long as muscular structure pertain to the ciliary body, and there be discharge-pipes left open, so long we may hope to lessen intra-ocular tension by eserine,—that is, when there is no active congestion of the ciliary body. That this is so will be evident from the following cases.

Mr. M., a gentleman aged 65, came under my care some four years ago on account of Myosis, which was so great as to interfere seriously with his vision. When I informed him of the nature of his malady, he told me that he had been affected some twenty years ago with the opposite condition, Mydriasis, for which he had used various irritants locally. Since he came under my care he has been using, almost daily, a solution of atropine, so feeble as to give about $\frac{1}{500,000}$ of a grain, for each instillation, if we allow for overflow; this kept his

pupils large enough for him to see without trouble. He visited me from time to time, and I found no appreciable change in the eyes until this summer, when I had reason to think that the tension of the left eye was greater than that of the right. A few days after, however, I could not detect any difference, and therefore thought I had been mistaken. However, on the 7th of October, I found T = + 1; vision had sunk to $\frac{10}{100}$, and there was incipient cup. I prescribed a solution of eserine, gr. j, ad ℥j., then diluted this to gr. $\frac{1}{4}$, then to $\frac{1}{8}$, and then to $\frac{1}{32}$. On October 23rd V = $\frac{12}{30}$. On October 29th, I ordered instillation of a four-grain solution of strychnia sulphate frequently during the day, together with the eserine twice daily; under this the eye has kept its ground.*

* Later on, in January, I found that the eserine was no longer required, the pupil being small, tension normal, and vision as in October.

Mr. R., a farmer, aged 70, consulted me on Nov. 20th, 1878. The right eye was quite blind, without red reflex, T = 2 +. The left had mere perception, T = 2 + also. He stated that the right had been blind for eight or nine years, but, as he could see well with the left, he took little notice. The left, however, about twelve months ago, began to be affected, and it has worsened rapidly of late; hence his visit to me. Pain, up to this time, has been no very prominent feature of the disease, and, indeed, the eyes shew merely the signs of chronic Glaucoma, with no active symptoms: incipient cupping of the left disc could be made out with some difficulty. Eserine, in one-grain solution, was prescribed for use thrice daily for both eyes, and strychnia frequently. He was asked to come again in a week, which he did, but I had been suddenly called away, and did not see him, and, as he had journeyed some twenty miles, he was angry, and did not reappear until January 7th, 1879, when I found both eyes softened, and

with left V = $\frac{2}{100}$. He states also that whilst he was using the drops his sight was better than it is now, and he has come because it has got worse since their discontinuance. Having got a fresh supply, he went home, to come again in a week, but did not till the 21st, when I found ciliary injection in both eyes, and pain, which he states has come on in the last few days, each time after the instillation of the eserine. Three or four days ago his sight was much better than it is at present; he could count his chickens and tell the time by his clock, which he cannot do now. However, he makes out Sn. xxx readily. He was therefore advised to cease the use of eserine for three days, then to use it only once daily, and to continue the strychine.

I introduce this incomplete case, chiefly on account of the remarkable effect of the over-use of eserine, which, from theoretical grounds, I had anticipated. At first, the ciliary muscle being

weak from long-standing inflammation, bore with good result the frequent stimulation by eserine, but when the tension of the eye became less, it, as well as the other structures, gained strength. The stimulus, which at first only caused temporary contraction of it, now became sufficient to produce permanent spasm, with its usual consequence, inflammation. Had its use been persisted in, doubtless acute Glaucoma would have supervened, as already there was considerable pain and marked ciliary injection in both eyes.*

* This happened precisely as here anticipated. He was given a weaker solution of eserine to be used only once daily, and he was told not to let more than a week pass without visiting me, and to come at all hazards at any time, if he became worse. However, he did not do so until Feb. 7th, when I found acute Glaucoma present in both eyes. His reason for not coming sooner was, that he had been so ill with pain in his eyes, and still more so in his head, that he could not leave the house. T = 2 + in both ; bare perception in left ; pain still great, though less than formerly. Cyclotomy was at once performed in both eyes ; the pain and weight were at once relieved, and since then the eyes have kept of normal tension, the sight of the left having so improved that, with 4½ +, on Feb. 21st, he made out Sn. xx with some little difficulty. The media by this time had become perfectly clear, and an exceedingly deep cup was vividly shewn by the binocular. On March 7, he made out xii

I have used eserine in the after-treatment of Mrs. D., the old Irishwoman, of whom I have spoken on page 43. Also in the case of Mrs. F., in whom Glaucoma was brought on by dislocation of the lens. In the history of her case I have stated that the first attempt at Cyclotomy was unsuccessful, owing to her flinching. After this I used eserine, but the eye remained as hard as ever. But after I had successfully operated, the eye became soft, in spite of the continued presence of the *causa morbi*, the swinging lens, and by the use of eserine it continued so for some time. However, in time, the irritation of the lens reproduced Cyclitis and Glaucoma, and was

with 8 +, but this does not give a full idea of his improvement. His visual field, formerly so contracted, is now increased, so that he can take in the proportions of a room, have a good idea of the furniture, &c., and he declares his belief that his sight increases daily. Eserine gr. $\frac{1}{32}$ to the ʒj is used occasionally, as there is still a tendency to harden.

There was considerable bleeding into the anterior chamber of the right, the whole of the iris being hidden. Next day, however, more than half was visible. On Feb. 25th, only very little blood was to be seen, and this soon afterwards completely disappeared, the tension of the globe becoming quite normal, and remaining so.

only stopped permanently by the removal of the lens. This operation I did easily, making a lower flap in the cornea, removing a piece of iris with the same incision, purposely, in order to avoid the prolapse of the iris, sure to result from the necessary loss of vitreous. For the future, however, I should prefer to remove a dislocated lens at once, if Cyclitis be present, and not wait.

In a very remarkable case, to which, as I shall describe it fully when treating of Sympathetic Ophthalmia, I will only allude here, I succeeded by means of eserine in softening an eye, absolutely hard and blind, and with the deepest cup in the disc I ever saw.

According to my present knowledge of the use of eserine, I would sum up its action as follows:—For acute Glaucoma it is useful to put the circular muscle on the stretch, and so render certain and easy its division in Cyclotomy. Unless its use be followed by Cyclotomy, I should expect it, from theoretical reasons, to do

harm rather than good, and this opinion is confirmed by the fact that it increases the pain until the muscle is cut.

Its use in some few cases of chronic Glaucoma, as that of Mr. M., may obviate the necessity of Cyclotomy, but such cases must be very rare indeed. I believe, however, that eserine will prove of the greatest service in the after-treatment, whether of acute or sub-acute Glaucoma, when the active symptoms have been relieved by Cyclotomy. It must be used with the greatest possible caution, only such a quantity being applied as will cause a transient contraction of the circular ciliary muscle. After further experience of the action of eserine, I now (March) prefer to begin with a $\frac{1}{32}$ or $\frac{1}{64}$ solution, instilling at night, and estimating its effect by a careful examination of the pupil next morning. If I find the pupil very small, I still further dilute the solution until the desired effect be produced. In some cases, as in that of Mr. I., a much

stronger solution will be necessary; this, in his case, is not to be wondered at, seeing that his ciliary muscle had acquired a bulk and strength sufficient to overcome a hypermetropia of $\frac{1}{7}$. In the majority of cases, however, the weaker solutions will be found quite strong enough.

## CHAPTER VI.

To shew how commonly over-action of the ciliary muscle is to be found, I will mention a few of the many cases in which I have found ciliary spasm cause Myopia of a considerable degree. In reading Professor Donder's remarks on a paper read at the London Ophthalmological Congress of 1873, I was surprised to find him disputing the presence of spasm as an occasional factor in Myopia, but I quite agree in his condemnation of the doing of Hancock's operation for the relief of it. I have just seen a case in which a large staphyloma followed the performance of it for Myopia.

The first case which especially called my attention to ciliary spasm was that of a gentleman, a mining engineer, whom I had known intimately from his childhood. He consulted me some eight years ago, on

account of having become rapidly short-sighted; he discovered this through being unable to see a surveying staff, at no great distance, until a bystander lent him a concave glass, with which he saw perfectly. Knowing that he was not short-sighted before, I was rather surprised at this, but my surprise soon yielded when I elicited that this occurred on his first day out after a long period spent over minute drawing. A single instillation of atropine cured his short sight, and revealed latent Hypermetropia of about $\frac{1}{30}$. In May, 1878, his apprentice consulted me for a similar condition; his case, however, was of longer standing. He stated that he had been getting short-sighted ever since he was apprenticed, some four or five years ago. I found V = $\frac{14}{200}$, and with 12 — $\frac{14}{20}$ nearly. Six instillations of atropine whilst he remained in my house brought his vision up to $\frac{14}{50}$, and with 40 — to $\frac{14}{30}$. He continued the use of the drug till June 8th, when I prescribed a solution of sulphate of morphia,

gr. iv. ad ʒj., and on the 22nd, with 40 — V was nearly normal, namely, $\frac{14}{16}$. In both these cases the retinal vessels, when examined by the direct method, moved in the same direction as the eye of the observer.

A gentleman, aged 40, engaged in sheep-farming in South America, consulted me in 1877, on account of irritation of his eyes. He said his employment chiefly consisted in riding all day visiting his various flocks, and that he had very little opportunity for reading and otherwise using his eyes for near work. Nevertheless, his eyes presented the usual signs of ciliary spasm, and after using atropine, I found he had a Hypermetropia of $\frac{1}{28}$. I advised him to get a pair of large round spectacles of this focus, and to wear them whilst riding. They gave him complete relief during his stay here, but as he has not thought fit to write to me from the Pampas, I am unaware of the result.

A case of unusual interest presented

itself in August, 1877. A young gentleman, one of a public school rifle team, consulted me on account of having, in school language, "shot his sight away." He told me that he had been diligently practising for the Wimbledon Public School Contest, and that of late he had required the assistance of a concave glass to see the target distinctly. He also said that others in the school had suffered in the same way, so that the matter had become ticketed with the phrase above mentioned. The glass used by him was 30 —, with which his sight was normal for distance. A week's use of atropine, however, removed all this Myopia, and revealed Hypermetropia of $\frac{1}{30}$.*

I have several times seen as much Myopia as this caused by near work, but never, except in these two instances, by

* His elder brother, aged 40, consulted me in May, 1878. I found he had Myopia of $\frac{1}{10}$, and that it had been progressive from boyhood until manhood. He states that a younger sister, also, is becoming short-sighted.

distant work; but it is not difficult to see how it could come about. Since my attention has been directed to the matter, I have learnt that it is by no means uncommon for ardent rifle-shots to assist their vision by a weak concave glass. So that what with compulsory education, with its adjuncts of badly-printed school books, and in many cases insufficient light, in-doors, and rifle-shooting out-doors, we promise to become, in the next generation, a people spectacled as our cousins on the Continent.

## CHAPTER VII.

It now only remains for me to point out the precautions to be taken and the dangers to be avoided in the performance of Hypos-cleral Cyclotomy. As to the performance of the operation itself, I have nothing to add to the description of it in the first case. I have tried other methods since, but have found none so easy or devoid of danger. Fix the eye by holding the conjunctiva below with toothed forceps; with the narrowest knife possible pierce the cornea, at a point opposite that of fixation, about a line from the sclerocorneal junction; as soon as the point enters the anterior chamber, alter the direction of the knife so as to clear the edge of the lens, thrusting it through the iris for about a line, then, drawing back the knife, cut the tissues up to the sclerotic. Unless this be done with a heavy hand there

is no danger of cutting the sclerotic. The operation is facilitated by the previous exhibition of eserine; and in cases of recent onset, especially in young subjects, the sensation of the giving way of the ciliary muscle is communicated to the hand most unmistakably. Dilatation of the pupil, first towards the section, and then all round, is a sure sign that the ciliary muscle has been thoroughly divided, but if the eye be under the influence of eserine, or if much aqueous escape on withdrawal of the knife, the pupil will probably soon contract. So much for the method of doing the operation.

As to the dangers. Prof. Schweigger, of Berlin, to whom I described the operation in May, 1877, told me I should cause traumatic cataract. This I have never done, and if one consider that the diameter of the lens is .35 inch, whilst the diameter of the base of the cornea is .48 inch, leaving a space of half .13 inch, that is .065 inch, and therefore con-

siderably more in the ciliary region, it does not seem difficult to perform this operation without wounding the edge of the lens at all. However, the best argument is, that in the many cases in which I have operated I have never met with the production of traumatic cataract.

The great danger to avoid is prolapse of the iris. This may come about from the knife being so thick as to cause a gaping wound, and so render it impossible to prevent free outflow of aqueous and engagement of the iris. This happened to me through using some double-edged knives, which I had made on purpose for the operation. On account of the double edge I did not perceive the greater thickness which the cutler had given to them, until the accident happened; but on finding this out I discarded them, went back to my original knife, a very narrow Graéfe, which had seen much service and been ground again and again, and this accident no longer befell me.

Another way in which prolapse can take place is through the straining of the patient. As I have said before, if a patient be not quiet enough to stand a flap operation for cataract, I prefer to anæsthetise before performing Cyclotomy. Lastly, if it be necessary to repeat the operation, either from inefficient performance in the first attempt, or from return of the symptoms after a perfect performance, it is best to operate at some distance from the site of the first. In one case of long-standing chronic Glaucoma—met with some time before I discovered the benefit of eserine in such cases—after an ineffectual attempt at Cyclotomy, I operated at a distance of about a line from the first section: ulceration of the cornea took place, unfortunately. As the eye was blind and painful, I now hinted at enucleation, and thenceforth saw my patient's face no more, so I cannot relate the sequel. In the light which I have now, I should certainly use eserine after Cyclotomy on

such an eye; and not until I had tried the effect of it and failed, would I advise enucleation.

This is the only instance in which I have seen this accident happen. Had the eye not been so damaged by the long-standing Glaucoma, I doubt whether this would have happened; still, I would strongly advise the second operation to be done as far off the first as possible, in order to prevent risk.

In the very few cases wherein prolapse of the iris has taken place under my hand, the only drawback has been that the wound has been longer in healing, and the eye has been somewhat irritable during this time. I have seen no other harm result. But it is a thing which I always strenuously try to avoid, as I trust anyone will do who may be tempted by the foregoing to cure Glaucoma by Hyposcleral Cyclotomy.

# ON THE

# DIFFERENTIAL DIAGNOSIS & TREATMENT

# OF

# EXOPHTHALMOS

# OF

# INTRA-CRANIAL & INTRA-ORBITAL

# ORIGIN.

## On the Differential Diagnosis and Treatment of Exophthalmos of Intra-cranial and Intra-orbital Origin.

The mechanism of the production of Exophthalmos by Aneurism in the head, whether of spontaneous or traumatic origin, has long been a matter involved in the greatest obscurity. Whether the aneurism be of the common or cirsoid variety; whether it be in the orbit or in the cranium, and if in the latter, in what part of it, and of what artery, are the questions hitherto unsettled, and are what I propose to discuss in the following Essay; and I think I shall be able to prove that the Exophthalmos which is characterized by extreme protrusion of the eye, together with complete, or almost complete, obstruction of *all* the various

lymphatic and venous systems, conjunctival, ciliary—anterior and posterior—vorticose and *retinal*, can only be produced by aneurism of that part of the internal carotid artery which lies in the cavernous sinus. For the better understanding of the argument, I shall first narrate a case of Exophthalmos which proved to be of this variety; after this, one of Exophthalmos produced by orbital causes, and then comment on the similarities and dissimilarities between the two.

About the first case, at the outset, I had no doubt that the cause was aneurismal, but I had doubt as to its site; about the second I had no doubt as to where the cause lay, but up to the first step of the operation, namely, the puncture by the grooved needle, I had some doubt as to its character. I think in the first case I have discovered a sign by which it may be diagnosed with complete accuracy; and in the second, I shall be able to shew means whereby the diagnosis

between orbital aneurism and simple tumour may be, at any rate, facilitated.

Mrs. McCann, aged 33, was sent to me by Dr. Clark on the 6th of June 1878, on account of great protrusion of the right eye. She stated that on the 6th of May she got a round-handed blow on her right ear, delivered by her husband's left fist, which caused her to reel, but not to fall; that at once she felt something give way in her head; and as soon as she recovered from the shock, she was conscious of a beating therein. About fourteen days afterwards her eyelids swelled in the morning, the swelling, however, subsiding after getting up, but this day, June 6th, on awaking, she discovered the globe was forced out, and the lower lid everted.

There was a faint bruit audible in the temple, but after compressing the carotid for a few seconds, I failed to hear it again. She said that the beating was stopped during compression of the vessel. After dilating the pupil, I found the

retinal vessels enlarged and tortuous, the retina infiltrated, and the perivascular lymph-spaces enlarged and plainly visible. I have only seen one other case in which these spaces were so easily seen, and that was in a man, aged 24, shewn to me by Dr. Dickinson at the Northern Hospital. In him the disease was presumably cerebral syphilis, of which the neuro-retinitis was a part, but as he died the day after I saw him, and no autopsy was allowed, I cannot be quite certain as to the diagnosis.

And now comes a sign to which I wish to draw particular attention. *Compression of the carotid stopped the current in the arteria centralis retinæ all but completely.*

Externally, the ciliary veins were uniformly engorged and tortuous—the whole of the symptoms going to shew that all the return circulation, venous and lymphatic, was gravely obstructed. There was no pulsation of the globe.

The woman promised to come for admis-

sion as an in-patient next day, but did not until July 19th, when I found the only change to be a great exaggeration of all the foregoing symptoms, the retina still more swelled and infiltrated,—this condition being beautifully shewn by the binocular ophthalmoscope, which gave the appearance of depth vividly,—the veins engorged to more than double their ordinary size, and vision reduced to mere perception of light.

This time she required but little persuasion to remain, and after keeping her in hospital a few days, to get her blood clear of alcohol, I tied the right common carotid on the 23rd. Next day the eye had retreated somewhat, and the sight was better. Of course, the beating in the head was stopped at once by the ligature. On the 27th the wound was nearly closed, but opened on the 29th, to give exit to a small collection of pus. On the 2nd of August the eye had so far retreated that I was able to revert the lid, and on

the 14th, at twelve feet, she could see Sn. xxx. and read $3\frac{1}{2}$. She now says her sight is as good as ever, though the eye is slightly protruded, and there is some engorgement of the ciliary and retinal veins.

The next case is that of Mrs. Morgan, aged 64, who first came to me about three years ago for protrusion of the left eye. The symptoms were so slight as to lead me to believe the cause to be neurotic, and I treated her accordingly. The proptosis seemed to be stationary during the time she was under my care, several weeks. After this I did not see her until the last week in September, 1878, when I found the eye, as in Mrs. McCann's case, protruded to the utmost limit, the lower lid everted, and the conjunctiva greatly swelled. In the lower and outer quadrant of the globe there was a close-meshed web of conjunctival veins, the web being so thick as to hide the sclerotic; elsewhere there was little or no engorgement. The fundus shewed

only rather less than normal circulation, the disc being somewhat bluer than natural, but the eye was perfectly blind. In the outer and lower part of the orbit a nodulated body could be, at first indistinctly, then, in the course of three or four weeks, distinctly felt, but the consistency of the body was not so decided as to allow any positive inference as to its nature. Pressure on the carotid caused no relief to the subjective symptoms, which indeed, beyond the blindness, were chiefly those attributable to inflamed conjunctiva ; also, unlike what happened in the first case, no appreciable change was made in the retinal blood stream by pressure on the vessel. As it was clear that the disease was in the orbit, though the nature of it was uncertain, I determined to dissect off the conjunctiva from the lower and outer part of the globe, and feel the tumour without the intervention of the swollen tissues. First, however, I passed a grooved needle through the lower lid into the tumour, in order to get some

idea, from the resistance to the instrument, of what I had to deal with. Finding the resistance to it indicative of tough, solid tumour, and not like what one would expect from its going through a wall of aneurism and blood-clot, however dense, I dissected off the lower conjunctiva, passed a finger well behind the eye, and found a solid tumour completely filling up the orbit. Seeing that there was no chance of getting it out without first removing the eye, I completed the enucleation, and then passing a straight, blunt-pointed bistoury down to the apex of the orbit, by a sawing motion separated the tumour from the tissues all round the cavity; traction with the fingers sufficed to tear it from its pedicle, which I then shortened as far as I could by cutting with curved scissors. Intense reaction followed, but in the course of a few days subsided, and the patient has since done well, and will most likely be able to wear an artificial eye.

This case gave me far more trouble in

diagnosis than the previous one, on account chiefly of the obscuration of the tumour by the swollen tissues. I regret now that I did not use the grooved needle earlier, for its use quite satisfied me that I had a solid tumour to deal with. But a good deal of the uncertainty arose from the statements of the patient herself. She said that she had received repeated blows on her temple, that the protrusion of the eye was sudden, and was preceded by a buzzing noise in her head; then, again, she said she had been in one of the Dublin hospitals, and there informed that she had "a tumour on the artery," and that the surgeon was about to operate, and had indeed fixed the day, but he died suddenly in the interval, and as his successor refused to meddle with the case (according to her account), she came over to me. After a time, however, I discovered that she had been in close communication with my first patient, and seeing how like her own eye was to Mrs. McCann's, she fitted Mrs. McCann's symptoms to

her own case, and supplied me with a pretty puzzle. When I fully appreciated this, I discarded the influence both of her statements and the mythical diagnosis of the Dublin surgeon—that is, if the diagnosis were his—and with the result I have stated.

In the first case I had no difficulty in arriving at the diagnosis of aneurism at once, but the localization of the aneurism was not so easy. I believe it to have been aneurism of the internal carotid, after it emerges from the petrous bone; and I ground my theory on three reasons. First, that the concussion of a severe blow on the ear would be concentrated and spent at the point of the wedge of the petrous bone, violently compressing the artery, or at any rate jarring it, and the blood in it, at this point, *especially if the blow were synchronous with the heart's systole.* I may here mention that there was an undoubted history of Syphilis, so that the arteries

were in all probability more liable to rupture than is usual at the age of this patient.*

My second reason is the totality of the obstruction to the venous and lymphatic systems. In this respect the eye presented a great difference from that in the second case. In the former all the visible veins, conjunctival, ciliary, retinal, and the retinal lymphatics, were swelled enormously; in the latter, although the tumour was so tightly wedged in the orbit that there was no room to pass round it a narrow bistoury without cutting here and there, the only veins affected were in the lower and outer part of the exterior of the globe. Nothing short of pressure on the cavernous sinus which normally receives all the blood and lymph of the

* A surgeon, whose pathological knowledge I hold in great esteem, one of the many who saw this case in the interval between June 6th and July 19th, suggested Syphilitic Gumma as a possible cause of the exophthalmos. Whilst no one can be readier than I to concede the wide-ranging power of Syphilis, I think that the history in this case puts Syphilitic Gumma out of court altogether.

globe and orbit, behind the lids, could accomplish such total obstruction as was present in Mrs. McCann's case.

The most remarkable circumstance, however, in this case, is the fact that pressure on the common carotid artery stopped the flow of blood in the retinal artery, all but completely. When I first saw this, without being aware of its crucial diagnostic significance, I was much struck by it, and repeated the experiment again and again, so that I could by no possibility be mistaken about the phenomenon. Now, I tried the same experiment in my other case, and found absolutely no change, in the retinal circulation, result from compression of the carotid; moreover, I have since tried it in several healthy men, and found in like manner no change; and finally, I have lately tried it on the *left* side of this very subject of intracranial aneurism, and found that although now she has no cerebral circulation from the right common carotid, yet the anasto-

mosis through the communicating arteries is so free, that in spite of my using a binocular ophthalmoscope, with high magnifying power, I have been quite unable to detect any change whatever in the right retinal circulation when the left carotid is stopped.

It is clear, therefore, that whilst the aneurism allowed blood to flow freely through the ophthalmic artery, which arises from the cavernous portion, just as it emerges from the cavernous sinus, it would not allow, when the carotid was compressed in the neck, the blood to find its way from the communicating arteries through the cerebral part of the carotid to the ophthalmic artery, and so carry on the retinal and other parts of the orbital circulation. It seems, therefore, from this fact, that the aneurism had so bulged upwards as to close completely that part of the carotid artery above the origin of the ophthalmic branch.

As my friend Dr. William Williams

has suggested, this has not been without significance. The patient has had no cerebral symptoms beyond slight giddiness, which, indeed, she has often had before the onset of the disease, and therefore it is not to be put down with any certainty to this, or to the treatment. If the cerebral part of the carotid were blocked just above the origin of the ophthalmic, the communicating arteries would be so enlarged as to carry on the cerebral circulation perfectly at once, after ligature of the carotid in the neck.

In summing up, I think I may reasonably say, if we have, in a case of Exophthalmos, *all* the return circulation obstructed, however slightly, and especially if compression of the carotid stop, or lessen, the circulation of the central artery, the *causa morbi* is intra-cranial ; whilst, in a case of Exophthalmos, however extreme, if only a part of the veins be obstructed, no matter how greatly, we have to do with mischief in the orbit. Whether

the cause in either case be aneurism or solid tumour, must be judged very much by the history, which sometimes, as in McCann's case, may be very definite, but at other times, as in Morgan's case, may require a very close scrutiny to sift the chaff from the wheat.

That the differential diagnosis of intra-cranial and intra-orbital obstruction is a matter very full of practical consequence, will be evident from the following considerations. Had we, in McCann's case, sought for the disease in the orbit, we should have removed a good eye and done no good to the patient; had we, in Morgan's case, tied the carotid, we should equally have done no good to the disease, but, very probably, judging from her age and condition, have brought about her death by secondary hæmorrhage.

ON THE

# TREATMENT OF GONORRHŒAL

AND OTHER SEVERE FORMS OF

# PURULENT OPHTHALMIA.

## On the Treatment of Gonorrhœal and other severe forms of Purulent Ophthalmia.

It is somewhat singular that no attempt should have been made to improve the treatment of the graver forms of purulent inflammation of the conjunctiva. As I shall shew further on in this paper, the older writers advocated the same treatment which is advised now by the later writers, such as Bryant and Carter. The latter, in what I think is perhaps the best chapter in his book, lays down exceedingly good rules for the general treatment of these cases; but he reiterates the old advice as to the use of strong caustic solutions, and even of solid salts, to the eyelids. I cannot but think he does not lay before his student hearers the full significance of the danger of the severer forms of purulent ophthalmia, such as the gonorrhœal, *under the ordinary treat-*

*ment.* He does say, however, page 229* "When it is caused by inoculation of gonorrhœal pus, or the secretion of pre-existing purulent ophthalmia, of whatever kind, it rapidly produces extreme swelling and profuse discharge, often attended by ulceration or sloughing of the cornea, and loss of sight." Had he gone on to say, "in spite of all you can do," I should find no fault with the statement, for I think it will be acknowledged that such is by no means infrequently the termination of these cases, even under the most skilful hands.

Bryant, still more recently, advises an application to the conjunctiva of solid stick of nitrate of silver, ice to lids, bleeding by leeches, etc. Constitutional treatment by tonics, especially by iron and quinine, without which drugs, it would appear, no surgical patient ought to get well, is the last recommendation.

I trust to be able to shew that the

* *Diseases of the Eye*, by R. Brudenel Carter.

severest forms of the malady, both in adults and infants, are amenable to a treatment at once painless and safe, and which requires no more skill for its conduct than that possessed by a nurse of average intelligence.

As in a preceding Essay, I shall follow out the steps whereby I have been led to depart from the old methods, and to adopt something altogether different.

Early in June, 1872, I was called to see A. B., a not very robust young gentleman, for a supposed severe cold in the eye. I found the usual signs of this, redness and slight swelling of the eyelids and of the conjunctiva, and some mucous discharge. He was advised to keep indoors, to use a collyrium of acetate of lead, gr. ij to the ounce of distilled water, and to take an aperient.

Next day, however, the symptoms had so greatly increased in severity, that I ordered him to bed, without at first suspecting gonorrhœal infection. But, during

the time necessary for the patient's donning his night-dress, suspicion was aroused, and I found that he had a virulent urethral discharge. The gravity of the case was at once apparent, and measures were taken accordingly. The sound eye was carefully sealed up with plaster, the edge of which and the skin adjacent were thickly coated with collodion; the temple was freely blistered; the lids of the affected eye, which could scarcely be opened even at this early period, were covered with pieces of lint made cold by being laid on a block of ice; the discharge was frequently syringed away with a weak solution of Condy's Fluid, the lids were kept from sticking together, and so penning up the discharge, by frequent anointing with oil; also, it was sought to lessen the tension of the ocular conjunctiva, which was in a state of chemosis, and that of the upper lid by scarification; later on, when inspection of the eye itself was prevented by the great projection of the

upper lid, the conjunctiva of the latter was painted with a solution of glycerine of tannin, the strength of which was increased day by day, but never so as to cause pain. Great caution was indeed necessary lest a small temporary increase of pressure on the cornea should cause it to slough altogether. Nevertheless, it was never thought great enough to warrant, what I considered at that time, the extreme procedure of dividing the outer canthus.

The disease appeared to run its course without being markedly checked by the treatment, but at length, on the seventh day of attendance—ninth of disease—a slight change for the better took place; the tension of the lids, as shewn by their swollen shiny red appearance, began to lessen, and a stronger solution of the lotion could be borne without pain.

I used the glycerine of tannin for two reasons—first, because I believed that the lead lotion employed at first, though very

weak, had aggravated the disease, and I thought it probable that other metallic salts would do likewise; and secondly, because I hoped that the glycerine would lessen the inflammatory thickening of the lids by the copious watery discharge which it has the power of bringing from mucous surfaces.* The giving of pain was carefully avoided; the glycerine of tannin lotion was strengthened so as never to cause it. For most of the time the very cold lint was borne, but after the climax of the disease the patient preferred the lint to be merely dipped in iced water, and wrung out before being placed on his lids.

All this time, too, the general health was well attended to. General bleeding was not practised, but the heart's action was kept within bounds by the cautious use of aconite, and the bowels were made to act freely every day.

About the twelfth day of the disease

* See Marion Sims, *Clinical Notes on Uterine Surgery.*

the swelling of the lids had so far lessened that I was able to explore the whole of the cornea, and found in its upper part the peculiar groove which is usually produced in cases of such severe character as the one in question. This groove is described by authors as an ulcerated groove, but when one is able to see it, it presents the signs of a healing ulcer, namely, the edges are not excavated or even sharp, but the whole looks as if it were cut out with a gouge chisel and the edges scraped round. In this instance the groove began at a point level with the outer commissure, about a line from the sclero-corneal junction, and continued parallel to it for a third of the circumference of the cornea. The outer end of the groove was deeper than the inner. The patient was warned about touching his eye, and the treatment continued. All went on well till the twenty-second day, when, "'twixt sleep and wake," he bored his knuckle into his eye, with the result

of causing a considerable rupture of the cornea at the outer end of the groove, and a corresponding prolapse of iris. Of course, there was much irritation set up, and atropine was used to allay this, which it soon did. But as it was found to favour the bulging of the iris, after the first symptoms of irritation had passed away a solution of extract of Calabar bean in glycerine,* one part to sixty, was cautiously used; this kept the bulging part as small as possible, the groove filled up, and the perforation healed without any other accident. Optically the eye was not notably impaired; the pupil was of course slightly altered in shape, but in a few months afterwards the patient averred that he was unaware of any difference between the affected and the unaffected eye.

Now, in reviewing the foregoing case, I am unaware that I could have done better with the light which I had at the

* It is to be remembered that in 1872 eserine was not procurable.

time, save that more might have been done to protect the cornea from mechanical injury. The patient had, however, been so quiet during the acute stage that it was thought unnecessary.

I am aware I did not adopt the heroic treatment advocated by some authors, namely, that by application to the conjunctiva of powerful caustics, such as strong solutions of nitrate of silver, or even of the solid stick of this salt. In the case in question I simply dared not. Between the first and second day of visitation the disease had made such a leap, and the patient had so much pain after the instillation of the weak lead lotion, that I could not help thinking it had been intensified thereby. But the other measures were well followed up. Scarification in the earlier stages was freely employed, though I never ventured on the extraordinary plan advocated by Mr. Soelberg Wells, who proposed to treat generally by iced compresses, but

after scarification to use hot sponges for encouragement of flow of blood. Surely it is not good practice to alternate rapidly a temperature little above freezing point with one as little below boiling point as can be borne.

It may be well to digress here, and recapitulate more particularly the courses recommended by the chief writers during the last quarter of a century:—Mackenzie, fourth edition, 1854, advises free blood-letting, both by venesection (10 to 30 oz.) and leeches (6 to 24); scarification of conjunctiva, and even cutting out of folds of it; free purgation, diaphoretics, alteratives, as calomel with opium, or instead of these iodide of potassium. Of local treatment, he says of eyes affected with gonorrhœal ophthalmia, that "*Soaking them constantly with tepid water*, or laying emollient cataplasms over them, *would be almost certain destruction, and, on the other hand, a perpetual succession of stimulating solutions and salves would be not less detrimental.*"

He insists on careful cleansing away of discharge, and condemns lead and zinc lotions, preferring nitrate of silver, of a strength of two to ten grains to the ounce of distilled water. He mentions also that some practitioners * trust entirely to touching lightly the conjunctiva with the lunar caustic pencil. But he says, "I conceive that if only caustic is employed, without depletion, the eye is very likely to be lost." Counter-irritation he strongly advises from the very first.

Next in authority, perhaps, is Stellwag von Carion, who advises the use of nitrate of silver much as Mackenzie does, preferring it to the solid stick, but acknowledging even weak solutions may act prejudicially. General bleeding he does not mention, but speaks favourably of local bleeding. Of iced compresses, used as in the case above related, he speaks highly. The division of the outer canthus

* *Vide* Desmarres, "*Traité théoretique et pratique des Maladies des Yeux.*" 1847.

is to be made "if the danger appears very great." Scarification and exsection of folds of the chemotic conjunctiva are at least untrustworthy.

Fano, in his account of the treatment of this disease, is noteworthy only through his mention of Gouzée's plan, in which "on cautérise les *quatre* paupières, alors même qu'un *seul œil est malade*." He has also a rap at English surgeons in the person of Sir Astley Cooper, who, in 1829, on a visit to Dupuytren's clinique, was shewn a young man affected with gonorrhœal ophthalmia. Sir Astley advised the coaxing back of the urethral discharge by means of a sound kept in the urethra, and the administration of a pill containing five grains of calomel every two hours until the production of salivation. The eye, however, Fano adds drily, burst two days afterwards, in spite of this treatment.

He, however, thinks no better of Dupuytren's treatment, which consisted

in the blowing in of calomel once or twice a day, and in the evening of instillation of laudanum.

Bader and Wells concur in reliance on iced compresses, cauterization by mitigated nitrate of silver, local bleeding, and scarification. Wells alone advocates application of warm sponges after the latter operation, as above mentioned.

Through all these recommendations there runs a very evident thread of doubt as to the propriety of each, and only about this is there no doubt, that gonorrhœal ophthalmia is one of the most fatal of eye diseases. And when we consider the lamentable disaster which occurred to one of the most eminent surgical writers of the day, who lost his eye through accidental inoculation from a patient, though he had the advantage of the best skill which could be afforded in London, it does not seem presumptuous to advocate something different.

Statistics as to the result of treatment

are difficult to get at. Lawrence,* quoted by Mackenzie, says, of fourteen cases, nine had only one affected, of which nine eyes, six were lost; of five cases having both affected, out of the ten eyes, six were lost and four saved, and three retained perfect sight, though one had anterior synechia and one leucoma. A gloomy list indeed!

Considering the great frequency of gonorrhœa, it is a matter of surprise that the eye affection is so rare. No other case came before me until December 3rd, 1873, when, in the space of a fortnight, I saw three cases, the first of which, a youth, C. D., applied at St. Paul's Eye and Ear Hospital with one eye in about the same stage as that of A. B. on the first day of attendance, and the other in a state similar to A. B.'s at its height. The case of the latter was brought forcibly to my mind, and I could not help thinking of the little

* *Treatise on the Venereal Diseases of the Eye*, p. 25. London, 1830.

effect the treatment had in preventing the chief danger to the eye, namely, the enormous thickening of the tarsal and ocular conjunctiva, and the consequent risk of ulceration and sloughing of the cornea. In the iced compress I had lost confidence, so I did not order it to be applied, but merely that the lint covering the eyes should be kept wetted with the lotion used for instillation. Of course, the other ordinary treatment of cleansing and anointing was used. The lotion with which we began was of sulphate of zinc, two grains to the ounce, afterwards increased to four grains. When I saw him next day, I found that the matron, accustomed to treat so many cases with warm applications, had put outside the lint a piece of gutta percha, which piece, however, was so much smaller than the moistened lint, that the character of the dressing was not fully decided ; evaporation was very slow, but at the same time not com-

pletely checked. I examined the lids with some apprehension, and to my delight found them rather better. I resolved, therefore, to take the hint. I had previously to this been in the habit of using warm and moist applications for various inflammations of the globe itself, in which cold is generally prescribed, and, having been long persuaded that moist heat is the most powerful agent for preventing and limiting acute inflammatory swelling and suppuration in other parts of the body, I determined to follow the lead I had got, and to make a cautious trial in C. D.'s case. Accordingly, the lids of both eyes were covered with a large piece of lint dipped in the lotion, and an ample piece of gutta percha was carefully bandaged over all. I looked at the eyes with some anxiety six hours afterwards, but found no reason to regret the treatment. The lids had lost completely the tense shiny appearance, there was no appearance of coagulation of

discharge at the commissure, and the patient was quite comfortable. The treatment was therefore continued, the grave symptoms lessening materially every day. The severity of the disease in the worse eye may be judged by the fact that the affected groove was found, when we were able to lift the lid, to extend farther inwards than in the case of A. B. No rupture took place in this case, as the accident was well guarded against, and the only defect was in appearance, caused by the dense white crescent which filled up the ulcerated groove. Nevertheless, as the upper lid covered it, it was no detriment. The less affected eye recovered without any damage whatever.

In the other two cases what was noteworthy may be stated shortly. Of these, one was also a youth, E. F., who was in hospital on account of congenital syphilitic kerato-iritis. Being convalescent, and having a natural turn for nursing, he was employed by the matron to

assist her in the treatment of C. D. Although he had been warned of the danger of contagion, he managed to inoculate one of his own eyes, which, when my attention was called to it, shewed the usual signs of early gonorrhœal inflammation. He was at once put to bed, and the same treatment as in C. D.'s case was followed. *The eye never became worse*, and was well in a few days.

The third case was that of a married woman, G. H., who applied at St. Paul's on the 10th of December, 1873. Both her eyes were in an advanced stage of gonorrhœal ophthalmia, and there could be no doubt from the appearance of the lids that the cornea was severely ulcerated. Although warned of the danger of losing both eyes, she could not be persuaded to become an in-patient of the hospital. However, under as careful treatment as could be afforded to her as an out-patient, the discharge and

swelling of the lids soon subsided. On account of temporary absence, I did not see her for several days, when I found that the gonorrhœal signs proper had ceased, but that she had a perforation of the cornea and adhesion of the iris in both eyes. With similar treatment to that pursued in like circumstances in A. B., both eyes recovered with less damage to vision than might have been anticipated.

The next case I had was that of a widow, aged 33,. a housekeeper out of place. Her eye presented the signs of fully developed gonorrhœal inflammation, lids shiny and tense, the upper overhanging so that the cornea could not be seen. After a few days, however, of treatment, the tension was reduced so as to admit of a full inspection of the eye ; it was seen that the disease had been taken in time, the cornea being uninjured, and the eye soon became perfectly well. In spite of her vehement denial of there being any

possibility of her having caused the disease by inoculation from her own person, I was informed by the matron that the state of the sheets left no doubt that she was suffering from profuse gonorrhœa during her stay in the hospital. Beyond an occasional aperient, on account of constipation, no other than local treatment was used.

In the next case I was not so fortunate, as the patient had the disease for some time before I saw him, and the cornea was necrosed before any treatment was adopted. A carpenter, aged 26, came from Whitehaven to the hospital. He stated that he had had gonorrhœa for some weeks, and that about a fortnight before he came to me symptoms of inflammation of the eye had been present, gradually becoming worse. The lids were now so swollen as to render it impossible to view the cornea. The usual dressing was applied, and he was strictly enjoined about the treatment, as he refused to

become an in-patient. Three days afterwards, he changed his mind, and was admitted. The lids at this time had improved so much as to enable me to see the cornea, which I found to be dull, opaque, and evidently about to melt away. This state must have been brought about before I saw him, for, as I have said before, on my first seeing him the lids were so swollen as to prevent my opening them, whereas, on the third day of treatment I could do so easily. It occurred to me at the time to incise the cornea, but I did not, because I looked on the necrosis as being caused less by its own inflammation than by the starvation of its tissue, consequent on the great pressure of the swollen lids, and of the chemosis of the ocular conjunctiva. But in the light of this case, seeing that nearly the whole of the cornea died—melted away—should I have a similar case, I would make an experimental incision.

My last case occurred in a married gentleman, aged 36. He consulted me on account of what he termed a severe cold in the eyes, which had come on in the last three or four days. The appearance of the eyes being more grave than one usually gets in catarrhal inflammation, I enquired as to the possibility of urethral contagion. This he denied with such a shew of honesty, that I was fain to prescribe as for an ordinary catarrh. But just as he was about to leave my consulting-room, I begged that I might satisfy myself as to the existence or not of gonorrhœa, to which he assented with such candour, that I had no difficulty in believing what he told me, namely, that he was quite unaware that he had it. Gonorrhœa he had, however, though the symptoms were not very severe, and as this was the first time he ever had venereal disease, he was ignorant of the symptoms. Three days' strict treatment was sufficient to so reduce the eye

affection as to enable him to do without the impervious dressing, and after this he only required the occasional use of an astringent collyrium to get quite well.

Measured by the condition of the urethral discharge, this was not a bad case, but I have no doubt that, under the ordinary treatment of escharotics, etc., no such speedy and happy result could have been brought about.

Besides these few cases of gonorrhœal ophthalmia in the adult, I have treated in the same fashion very many cases of ophthalmia neonatorum. No inconsiderable number of these were, if not of actual gonorrhœal origin, of one no less virulent in its action, and not a few occurred in children affected with congenital syphilis. In these I have had only a single instance of perforation, and that in the infant of a drunken woman, who neglected the treatment. I think authors make too light of this disease. Instillation of

astringent salts, washing away of discharge, &c., may do well enough in mild cases, but in the more severe, I fear perforation of the cornea is no infrequent consequence. Only lately I was consulted by the mother of a child, which, from the beginning of the disease, had been attended almost daily for some weeks by a specialist, and treated according to the usual method; nevertheless both corneæ had sloughed bodily, and, of course, all useful vision had been destroyed. In my capacity as Surgeon to the School for the Blind, I am brought into contact with many such cases. It is usual to put down the disastrous results as occurring only after the ignorant treatment of midwives, or other unfit persons, but I fear that the number of lost eyes in the hands of skilful obstetric surgeons is by no means small. An example of this occurs to me. The child of a clergyman, who had been treated with every possible care by the surgeon

in charge, was brought to me in the autumn of 1877. In this, too, both corneæ had sloughed, and all useful sight was destroyed.

Gonorrhœal ophthalmia in adults is acknowledged to be a fatal disease, even in skilled hands,—why not confess at once that it is equally fatal in infants, in whom also it is far more common.

But since I have adopted the treatment described above I have had no reason to fear gonorrhœal ophthalmia, whether in the infant or adult. I can say fearlessly, that in every case the symptoms, such as the swelling and tension of the lids, the amount of discharge, and the distress of the patient, have uniformly begun to decrease as soon as the dressing has been applied, and I therefore confidently recommend this plan as a very great advance on the old plan of treating gonorrhœal and other severe forms of purulent ophthalmia.

# NEURO-RETINAL ATROPHY.

## Neuro-Retinal Atrophy.

I shall consider this condition as arising from antecedent inflammation, and the subsequent starvation of the nervous tissue by the contraction of the inflammatory products lessening the calibre of the arteries. This statement is of course wide-reaching, and doubtless it is putting the matter roughly, but as there is no doubt that to the narrowing of the arteries is chiefly due the malnutrition of the tissues involved, and as it is to the question of the mode of bringing about the enlargement of the arteries that I purpose to address myself, I shall not discuss the various shades of difference presented by the optic disc in its passage from a state of perfect health to one of atrophy.

Excluding atrophy from hydrostatic pressure — Glaucoma — an atrophied disc shews much the same face, whether it be

of syphilitic, rheumatic, or tabaccic origin; or, in those cases wherein no morbid diathesis has been hitherto traced, what we may term, for the present, idiopathic origin. And in all these, even if the morbid cause be removed, it is useless to expect great improvement in the nutrition of the neuro-retinal tissue if the plastic effusion have begun to contract; that is, unless some influence, more potent than such contraction, be brought to bear on the arteries, cause them to dilate actively, and so resist compression. Seeing that this plastic contraction, once begun, goes on unceasingly, it is evident that any remedy for the resistance of such contraction must either have a very abiding effect, or must be applied frequently and for a long time: and, as most drugs, which have a marked influence on nervous tissue, shew their physiological effect quickly and for a short time, and are speedily eliminated, if life be prolonged enough, it would seem to follow that in attempting to resist this plastic contraction we must bear this in

mind, and use whatever drug we may employ in such fashion as to keep the nervous tissue as constantly as possible under its influence.

Without asking for a full acquiescence in what I have said, I suppose everyone will admit that a drug which shall be capable of actively dilating the arteries shall, *pro tanto*, be beneficial. Is there such a drug? I answer, in the words of Brown-Sequard,* "The means of increasing the nutrition of the spinal cord may be placed in two groups—the medicinal and the physical. As regards the first group, we know but one remedy that really deserves confidence: it is strychnine." . . . . "How does strychnine act to produce this augmentation in the vital property of the spinal cord? In two distinct ways: first, in increasing the amount of blood in the spinal cord; secondly, in acting in a special and direct

* *Lectures on the Diagnosis and Treatment of the Principal Forms of Paralysis of the Lower Extremities*, by C. G. Brown-Sequard, M.D., F.R.S. 1861.

manner on the tissue of the cord. As regards the first mode of action, we shall only state here, that it is a positive fact that the quantity of blood circulating in the spinal cord is very much increased, and that consequently its nutrition is also increased. As regards the second mode of action, the admirable researches of MM. Martin-Magron and Brisson have established beyond doubt, that even when the spinal cord does not contain any blood, *strychnine, directly applied upon, or in, that organ, increases so much its vital property* that reflex tetanic spasms may be produced." If the spinal cord be so exalted in function by the local application of strychnine, why not the optic tract?

I suppose ever since the extraordinary influence, which strychnine possesses over the nervous system, was discovered, it has been used for the relief of Amaurosis. Mackenzie mentions it as a matter well known, but classing it with "arnica montana, helleborus niger, naphtha, phosphorus,

and a host of other drugs," condemns one and all in the contemptuous paragraph, "but it is extremely doubtful if they have been productive of the least good effect."

This, I imagine, is almost, if not quite, the verdict now. Mr. Brudenell Carter, in his *Diseases of the Eye*, page 436, speaks with some reserve about the apparently good effects of strychnia in a few cases, but very positively that "in the majority no effect of any kind has been perceptible." He advises, further on, that the administration—by hypodermic injection—should be carried on until some of the physiological effects of the drug, such as twitching of the muscles, be manifested; that, thenceforward for a fortnight, the patient should be kept under its influence to a degree slightly short of this, and if at the end of that time no improvement result, the use of the medicine should be abandoned.

An eminent authority, in a private

conversation, replying to my question as to his ideas about the treatment of optic atrophy, answered that he would give mercury, and on my asking if that failed, said, "I suppose you allude to strychnia —well, I don't believe in it."

Mr. B. Thompson Lowne, who may be considered as giving the current opinion in London, in his *Manual of Ophthalmic Surgery*, page 141, says:—"Tr. nucis vomicæ has certainly a beneficial influence in checking white atrophy for a time in some cases. *As a rule, when atrophy has commenced, it is too late to expect much from treatment.*"

I take it, therefore, that in this last sentence is expressed the general opinion about strychnia and optic atrophy. From all these statements we may gather that there are no rules for our guidance as to the class of case in which the administration of the drug is beneficial, or likely to be so; and further, that if we expect to do any good at all, we must keep

our patient on the verge of strychnial tetanus. How imminent this seems to Mr. B. Carter, is shewn by the fact that he insists on his patients keeping by them a draught containing twenty-five grains of chloral hydrate, as an antidote, to be taken if symptoms of poisoning ensue.

Now let us compare these methods of giving strychnia with the methods of giving the other two drugs which have the most marked influence on the eye, namely, atropine and eserine. It is well known that with the former we must, by the mouth, give the drug so largely as to cause symptoms of poisoning before we can cause marked dilatation of the pupil in a healthy person ; not in all cases, perhaps, but in nearly all. We also know that a quantity, almost inconceivably small, applied to the conjunctival sac, will produce full dilatation of the pupil in a healthy person, without affecting the general system one whit.

We know also that in a diseased state of the iris,—iritis,—where the radial fibres, by effused lymph, are paralyzed to ordinary stimuli—light and effort of accommodation for distance—a few applications of atropine to the conjunctival sac will bring about full dilatation. The drug exerts its action on the first vascular system which it meets, without spending the greater part of its strength uselessly in the general system. So with eserine.

Now, long before I became specially interested in Ophthalmology, I was much impressed with the singular power which strychnia has over the arteries of the cerebro-spinal centres. Consequently, when the ophthalmoscope first revealed to me that in the fundus oculi we have, as it were, a photographic example of the cerebral circulation, I at once felt that there must be some kinship between strychnia and the dwindled vessels characteristic of optic atrophy. For some time I gave the drug by the mouth, in the form of the tinc-

ture of nux-vomica, pushing it to the verge of strychnism, as Mr. Carter and others later on have done by hypodermic injection of sulphate of strychnia. Like his, my results were by no means striking. But when from abroad there came the new method of hypodermic injection, I was at once impelled to consider whether some means, still more direct than this, of introducing the drug into the ophthalmic circulation could be devised, and equally at once thought of instillation into the conjunctival sac.

At first, for this purpose, I used the liquor strychniæ of the British Pharmacopœia: this, as is well known, is a solution of strychnia, gr. iv. to the ʒj of distilled water, with the aid of rectified spirit. On account of the irritant qualities of the spirit, this can only be borne as a rare application, and the results I obtained, though I think as good as those got from hypodermic injection, were by no means satisfactory. In the Liverpool Hospital Reports for 1872,

I published some cases treated in this way.

I did not, however, make much progress in improving the treatment until I had the co-operation of an exceedingly intelligent patient, whose case I shall now relate.

Mr. A., a stout gentleman, æt. 60, consulted me on the 9th of January, 1875. Before giving me any history of his case he required me to inform him what was his malady. As he had in each eye a blue disc, with vessels narrow as threads, and various stellate black spots scattered over a very pale fundus, I had no hesitation in telling him that he had neuro-retinal atrophy. Then he shewed me a written diagnosis, given to him, nine months before, by a London Ophthalmologist, which was to the effect that he was suffering at that time from atrophy of the choroidal epithelium.

After I had explained that there was no necessary antagonism between the two statements, he gave me the following

history. Some five years ago he consulted a physician for rheumatism, and some mention having been made about his sight, it was found, on trial, that the left eye was much worse than the right. He could give no further particulars, and, the rheumatism being relieved, the eye was forgotten, and nothing was done for it.

But in July, 1872, he found one morning that his right eye was dim, "as if muslin were before it," and this condition getting worse, he consulted his own surgeon, who made light of it, and gave him a "wash."

In the absence of this gentleman, as the eye got steadily worse, he consulted an oculist, who at once performed some slight operation on the eye, which produced a good deal of sub-conjunctival ecchymosis, but otherwise caused no change. Then he had vigorous antiphlogistic treatment, low diet, wet cups four times to his temple, frequent saline aperients, and a seton in his nape for five months.

Still getting worse, he went to London

in October, 1873, consulted a physician of high standing, who told him that, with the exception of his eyes, he was a perfectly sound man. He then consulted two of the leading ophthalmologists, one of whom gave him the diagnosis above mentioned: both gave him to understand that his case was the reverse of hopeful. In May, 1874, he again consulted one of these gentlemen, who, as the sight was rather worse than in October, now gave a still more gloomy prognosis; and, indeed, made him believe that in his opinion the disease was absolutely incurable.

After this he forsook all idea of bettering his condition, gave way to melancholy, and avoided society. His sight remained almost stationary for some months, and when he came in January, 1875, I found with both V = $\frac{3}{200}$, the right eye being slightly better than the left. Later on, I found he had about $\frac{1}{30}$ of Myopia.

I looked on the case as so little

hopeful, that I told him unless he would make up his mind to at least two years' steady treatment, he had better leave it alone, and so save disappointment, but he said he would gladly do so, and would submit to any inconvenience. I began by hypodermic injection of five minims of liquor strychniæ; by its instillation thrice daily, and by giving a draught containing ♏xx of tincture of nux-vomica, also thrice daily. These doses were gradually increased until muscular twitching occasionally took place: however, he could, and did, bear for some time drachm doses of the tincture, four times daily, one injection of ♏xv of the liquor, and several instillations as well.

The instillation gave him some smarting, but he bore it without complaint. However, during the summer, applying the liquor strychniæ to the eye of a gentleman who had been the subject of albuminuric retinitis, I found so much pain caused that my attention was directed

to the preparation of such a solution of the drug as would not cause pain.

Now, it had not infrequently happened that some chemist, unused to the dispensing of *liquor atropiæ sulphatis*, had given, instead of it, the more stable *liquor atropiæ*, which contains a good deal of spirit. This, besides causing pain, produces in a much less complete manner the characteristic action of the drug:—in iritis, the pupil being scarcely dilated, and in keratitis, the disease being aggravated rather than relieved. It seemed, therefore, that the eye would not only bear more easily a neutral salt of strychnia, but would receive a greater benefit from it.

We accordingly used a neutral solution of strychnine sulphate, gr. iv. ad. ℥j., made by boiling the alkaloid in distilled water, and cautiously adding dilute sulphuric acid until a clear solution was obtained. Great caution must be observed lest the solution be too acid, as, in that event, much irritation of the eye is produced.

In Mr. A.'s case, as this solution caused no smarting, he used it much more frequently than the alcoholic solution.

From time to time, one of the three forms of treatment was given up for a while, so as not to weary the patient; and, incidental to this, an opportunity was afforded of comparing their different effects. The hypodermic injection in the temple was abandoned early, on account of the local inflammation set up: it was used for a few times in the arm, and then again in the temple; but, as here it at once set up cellulitis, it was altogether discontinued on the introduction of the neutral sulphate. After abstaining from the instillation of the latter for a week or two in the autumn, Mr. A. told me that he felt quite certain the instillation had more effect than the large doses of the tincture of nux-vomica, and that he was conscious of a diminution of visual acuteness when it was stopped.

On this hint I acted.

I have no doubt that the introduction into his system of these large quantities of the drug had improved his general health greatly; for, by this time, he had lost his melancholy, and become quite cheerful. Doubtless the improvement in his sight had a good deal to do with this, but I think some credit must be given to the drug for having improved the nutrition of the nervous centres.

I enjoined him, therefore, to instil only, and to do this as often as possible. He became so used to this that he often did it mechanically and unconsciously, as whilst he was talking to a friend, and trying one week how much he could stand, he used no less than *seven* grains of strychnia in this fashion. Some slight conjunctival irritation resulted from this, and afterwards he never used more than four grains a week. With occasional cessations, this was his mode of treatment until the end of 1877, when, as he had long been able to go about his work,

personally conducting a large correspondence, and reading after business was over for several hours during the evening—in short, using his eyes as if nothing had ever ailed them—we gradually gave up the instillation.

The discs had gradually exchanged the blue tinge for an almost normal ruddy hue. The binocular ophthalmoscope shewed that the flat disc had become plump and convex,—there was no possible error about this, for I gazed on it many a time and oft with gratified astonishment, — and numerous exceedingly fine vessels made their appearance, these being, in all probability, the offsets of the anastomotic branches of the posterior short ciliary arteries increased in size.

I have said that on January 9th, 1875, V = $\frac{3}{200}$. The first improvement noted was seen a few weeks afterwards, when he told me that the left eye, which had been slightly worse than the right, had now become equal to it. On the 14th of October he recognised

V of Snellen's test-types; on February 17th, 1876, with 6 + he read Sn. 5; on May 1st he managed to make out a few words of $1\frac{1}{2}$; on October 23rd, with 30 – at 12 feet, he recognised Sn. xl., and read Wecker's No. 1 with the 6 +, and this he maintained to the date of his death, which occurred, from apoplexy, on the 13th of March, 1878.

I have given this case at some length, because of the ostensible hopelessness of it; of the marvellous benefit resulting from the treatment; and lastly, of the good result being due to strychnia alone.

In most of the many cases in which I have used strychnial instillation, I have given mercury as well, at any rate, in the first instance; and although I have had no doubt in my own mind of the beneficial influence of the drug in the secondary treatment of neuritis, the detailing of many such cases of mixed treatment would not carry half the conviction as would this single uncomplicated case.

A case, shewing temporary benefit in

an eye, the seat of hopeless disease, came to me on September 9th, 1875. A middle-aged widow lady, spare and active, consulted me for failing vision in one eye. After dilating the pupil, I found the retina slightly detached close to the ciliary processes in the outer and lower quadrant, the cause being a small tumour, growing from the ciliary region. Fearing to shock her, as she was of a very nervous temperament, I did not tell her of the tumour, but merely spoke of the slight retinal detachment, hoping, as I gained her confidence, to break the communication of the fact gently. My caution was amply warranted, seeing that when I informed her, in December, of the necessity of enucleation,—which statement Mr. Jonathan Hutchinson confirmed,—she was prostrated for several days by severe illness.

On Sept. 9th, she could only recognise large objects, and, rather to gain time than anything else,—though I had some

slight hope that the tumour might become obsolescent, or, at any rate, stationary,—I prescribed the instillation of strychnia. To my surprise, on Oct. 11th, she made out Sn. V; on Nov. 3rd, 12; on the 18th, 8½; and on the 2nd of Dec., 6½. After this, however, the tumour began to grow rapidly, and the retina being extensively detached, it became palpable to herself—up to this time jubilant at the great improvement in her sight—that an active cause was at work. After seeing Mr. Hutchinson, she assented to my proposal to remove the eye, which was done on the 21st of January, 1876. There has been no return of the growth up to this time, February, 1879.

The case of Mr. A. is one in which I had to deal with atrophy, pure and simple, for I had no clue to the cause of it, nor have I been able, since, to learn anything. I believe hæmorrhage had been suggested as a cause, and to this the mode of Mr. A.'s death would lend sanction.

I have put this case first because it was first in time, and the treatment was by strychnine alone. I shall now proceed to consider some other classes of cases of more complex character, in which I have used strychnine, but in combination with other treatment.

Now, in cases wherein the cause of the disease is a definite poison, such as syphilis or tobacco, which can be neutralized, as in the former by mercury, or by the mere withdrawal of the excitant, as in the latter, it is exceedingly difficult to apportion the value of strychnia, and, in order to decide the question in a manner which could not be cavilled at, it would be necessary to withhold all other treatment during the giving of strychnia. I think such a plan in the case of syphilis would be unjust to the patient, seeing that to a person so affected, mercury is necessary in a degree little less than his daily bread.

In cases of syphilitic neuritis, I am in the habit of instilling strychnia as soon as the

acute symptoms have subsided, but doing it very cautiously at first, increasing the frequency if no harm result, withholding it if the eye flush.

During this time, *and long after all manifestation of syphilis has ceased*, I give mercury, for by no other treatment do I believe the syphilitic poison can be neutralized and eliminated.

In the case of tabaccic neuritis, and that form which for the present I term idiopathic, the case is different. As I have said before, I believe mercury has a great influence on the tissues of the eye in diseases other than syphilitic, and I therefore give it in acute neuritis of whatever cause. But in non-syphilitic cases I do not go on with it after the subsidence of the acute symptoms, and therefore one can more rightly estimate the effect of other treatment.

In the case of tobacco poisoning, another element has to be considered, because, of course, one always insists on the complete abstinence from the cause.

As some doubt has been thrown, by a recent writer, on the question as to whether there be a neuritis of tabaccic origin or not, I will digress for a short time on this point.

This writer is sceptical, on the ground that in Egypt and Turkey, countries in which almost all people smoke tobacco, the disease is practically non-existent. This is a taking argument, until we begin to consider the difference between Eastern and Western tobacco.

Now, to compare the stuff which sailors, coalheavers, cotton porters, dock labourers, and longshoremen generally smoke—that is, Limerick twist, nail-rod, black cavendish, shag, Chester cut, and that worst abomination, "prick" tobacco — with the fragrant, mild Yenidjeh, and other Turkish tobaccos, is to compare the man-eating tiger with the gentlest specimen of the domestic cat; both are of the *ordo Felis*, yet what a difference is there between them! So with tobacco! As a cotton porter told me, "One or two draws are enough to stay an empty belly,

and then we put up the pipe till hunger again brings it out." Such tobacco is no mere luxury; it is a genuine narcotic, used to stave off hunger, disappointment, and misery generally, and it is highly valued by its users, just in proportion to its numbing effects on the nervous system. Of the general influence of tobacco on the nervous system, no one doubts; and why any one should doubt, in the face of published facts, that tobacco sometimes attacks the optic tract, it is difficult to understand. But I suppose it is equally difficult for a man who never sees a certain class of cases in his own practice to believe the existence of such in the practice of others. What Mackenzie observed and recorded, and what Hutchinson has confirmed, is pretty certain to be correct.

Such cases are common enough in seaports, and, as the Hospital with which I am connected is on the line of the Liverpool docks, I am fortunate enough to see many, not only when the disease is far advanced, but also in the earlier stages.

Not infrequently one eye is attacked more vigorously than the other, and one can, in such cases, with a binocular, distinguish a difference between the two discs. There is not much to be seen, however, and in the ordinary examination with a monocular ophthalmoscope, this little can easily be passed over. The disc looks somewhat fluffy, is of a colour not easily to be described, but as near as I can convey in words, it is of a muddy reddish white; the vessels are small.

In one case, occurring in a powerful man of 24, who came to me with V = $\frac{2}{200}$, there were the usual signs following acute simple neuritis, the discs being woolly-white, protruding, and the vessels thin as hairs. He had been accustomed to smoke an ounce of the strongest tobacco daily for some years, so it is not surprising that the signs should be well marked. This case is, however, exceptional; the usual signs are those above-mentioned.

Everyone knows that tabaccic neuritis is very remediable in the earlier stages, when the use of the drug is stopped. Now, I am accustomed to treat such cases, after the acute symptoms have subsided, by the frequent instillation of sulphate of strychnia, and I believe that I get my patients well much more quickly than without; but as it is impossible to distinguish between the benefit resulting from the withdrawal of the *causa morbi* and the action of strychnine, I shall not detail cases. I may mention, however, that in the case above-mentioned, although of most unpromising aspect, the sight gradually improved until V = $\frac{12}{40}$, after which time I lost sight of him. He was a dull phlegmatic fellow, and as his occupation — that of a dock labourer — necessitated no very great acuteness of vision, he was content with such sight as he had.

I quite agree with Mr. Hutchinson, that there must be a special predisposi-

tion to this disease, seeing that so many smoke strong tobacco in excess without suffering impairment of sight. What is the cause of this predisposition remains yet to be made out.

I come now to a class which I mentioned at the outset as idiopathic, but which I believe has a definite origin just as those of a syphilitic character.

The first case which came prominently under my notice, and excited my attention, was one of total atrophy in a youth, about twenty years old, whom I had treated for Psoriasis. Now, my investigations into the etiology of this skin disease have proved to me conclusively that Psoriasis occurs in either women who have sustained large losses of uterine blood, or in their children, or in their grandchildren;—to put the matter in the reverse way, in any given case of Psoriasis, if a female, either she, or her mother, or grandmother had sustained such loss; if a male, then the mother or grandmother. The cases in which the

hereditary principle acts alone,—that is, in which the disease is traced from father to son without maternal influence coming into play at all,—are so few in number as practically to be of no account.

Now, as I have seen the sudden suppression of Psoriasis followed by the immediate outbreak of a very general rheumatic arthritis, and as I have seen, moreover, this same general rheumatic arthritis coexist with severe Psoriasis, and disappear *pari passu* with the disappearance of the Psoriasis, it was not difficult for me to believe that the same poison which produced the Psoriasis, produced the rheumatism, seeing also that the disease of the skin is as symmetrical as that of the joints, and therefore must have some general systematic cause; and as, since I have been in the habit of treating my Psoriasis cases as if they were cases of rheumatism, I have had no great difficulty in curing them, I am now perfectly satisfied that the two diseases are of the same causation.

When, therefore, I saw the white discs in this youth, it occurred to me to find out whether in cases of the so-called idiopathic neuritis, and its sequel atrophy, there might be such antecedent condition as there is in Psoriasis.

As surgeon to the Blind School, I have to admit many such cases, and for some years, wherever I have been able to get a history of the mother, I have found great loss of uterine blood, generally profuse catamenia, and flooding after labours.

I allude to the question of Psoriasis briefly here, as it is necessary for the development of my argument. Some day I hope to lay the full evidence of its causation before the profession.

A well-marked example of this class came to me, Sept. 14th, 1877.

Mr. L., a printer, complained of failing sight, which had been getting gradually worse for six months, and he applied now because he could no longer see well enough to do his work.

The discs were blue, and the vessels considerably diminished in calibre.

There had been no syphilis, and he had never smoked. V = $\frac{14}{200}$.

His mother, who came a few days after, stated that she was 70 years old, and still hale and strong. She was one of nine children, of whom there were eight living; that her catamenia began at her fifteenth year, and ceased at her forty-fifth; that the flow had always been very profuse, and she always lost greatly at her labours, of which she had had four.

I prescribed a mixture of iodide of potassium, the inunction of oleate of mercury, and the instillation of sulphate of strychnia. On Sept. 28th, V = $\frac{14}{100}$, and he read $4\frac{1}{2}$, the discs being somewhat warmer looking. On Oct. 12th, V = $\frac{14}{70}$, and he read $3\frac{1}{2}$; the discs now were distinctly flushed.

The mercury and iodide were now stopped, and a mixture, containing tincture of nux-vomica, was given; the

instillations also were used as much as possible. On Nov. 16th, he read $2\frac{1}{2}$, his vision for distance being as before. On the 30th, however, V = $\frac{14}{50}$ nearly. On Jan. 11th, 1878, V = $\frac{14}{40}$, and with 20 +, he read $1\frac{1}{2}$. The solution of sulphate of strychnia was now made of double strength, namely, gr. viii ad $\overline{3}$j, and on Feb. 22nd, V = $\frac{15}{30}$, and he read with 20 + Wecker's No. 1 test-type. On April 26th, V = $\frac{14}{20}$ nearly, and, as his eyes now began to shew some little irritability, the instillations were suspended. On May 3rd, he saw somewhat better, but after this his improvement was checked by grief, consequent on the sudden loss of his wife and two children. He had been working for some time before this, but now took a short holiday to divert his mind.

He used the drops only occasionally after May 3rd, because his eyes soon flushed up under their use. On August 5th, V = $\frac{15}{5_m}$ — the metric type of Wecker —

nearly. Now all medicine was stopped, and the instillation only was prescribed. But it was found that a single drop was sufficient to flush the eye, and, accordingly, all treatment was given up.

On Feb. 22nd, 1879, he visited me for the last time; he had been working full time, doing much by gaslight, and his sight was normal.

I think it not unreasonable to ascribe the merit of this cure to strychnia only. Doubtless, mercury was given, but only for the first few weeks, and I do not think that it need to have been given at all. Had I had this as a test case, I would have given none. I gave it empirically at first, and then withheld it, in order to see what strychnia alone would accomplish.

That sulphate of strychnia is no indifferent drug, but a powerful stimulant to the ophthalmic circulation, has been manifested to me in other cases as well as in the one just related. Three striking instances were of syphilitic origin; one, a young lady of

16, the subject of congenital syphilitic choroiditis, benefited by mercurialization, but after a few instillations of sulphate of strychnia, the eyes flushed up, and vision was dimmed; recovery speedily ensued when the use of strychnia was stopped. Afterwards, to be sure that the drug was the cause of inflammation, I tried it again; this time the first instillation flushed the eye, and later, a much weaker solution had the same effect.

In like manner, a boy of 17, whose father confessedly had been the subject of syphilis, tolerated the instillation for some months, and then could do so no longer, although it was cautiously tried again and again. He had been ill for four years; headache, fever, vomiting daily for nine months; then headache alone of a less violent character; then he was unable to walk for the six months ending December, 1877. He came to me in June, 1878, when I found him to have perception of large objects only; the discs were dead-white—not blue—with

very thin vessels, and he was dull of intellect. I did not get the history of paternal syphilis until some time after, but judging the case to be of this causation—although there were no other signs of the disease, his teeth especially being well formed—I mercurialized him vigorously, and used strychnial instillation. His sight improved greatly for a time, so that in four months he could read Sn. $5\frac{1}{2}$. Then he could no longer tolerate the strychnia, and the inability still continues. He still uses mercury, but the sight has remained stationary; his intellect, however, has greatly improved.*

Similarly, in a case of mild syphilitic neuritis, of recent origin, occurring in a merchant captain, who had only a fortnight ashore, as a matter of experiment I tried the instillation in order to judge of the treatment he should adopt at sea. Although the signs were very slight, mere muddy fluffiness of the disc, yet flushing took place after one or two drops, and very decided blurring of

* Later—May, 1879—he reads $3\frac{1}{2}$.

vision. The rapidity with which this flushing disappears after the withholding of the drug is an additional illustration of what I have said about the transitory nature of the effect, and of the necessity of the frequent giving of it in proper cases.

It seems, therefore, that there is a point of saturation to be reached in the use of this alkaloid, just as in that of atropia, and, as I have recently found out, in morphia also. With the symptoms of atropism all are familiar; morphia-sulphate, used excessively, causes great swelling of the eyelids; but, as far as I have seen, no such profuse lacrymation as is found in atropism.

Strychnia causes in the eye active arterial congestion, which is very well marked in the ciliary region; sometimes I have found also some conjunctival irritation, but this seems secondary to that of the globe. But if the solution of the sulphate of strychnia be acid, then pain and conjunctival irritation are set up at once in eyes which will bear a neutral

solution, instilled every few minutes, with impunity.

The method of preparing it is, therefore, of great importance, and I think the best is that given to me by Mr. Symes, Ph.D., of this town. Take of strychnia, two grains; of strychnia-sulphate, three grains; distilled water, one ounce; mix and boil for some time, and then filter. A little strychnia is left in the filter, leaving a perfectly neutral solution of sulphate of strychnia, containing about four grains.

This solution, like other neutral solutions of alkaloids, decomposes in time, and becomes slightly acid. As a rule, however, it is used up long before it has time to decompose, but I have known a good deal of pain caused by the use of a specimen which had been kept in stock for some time. It is necessary, therefore, to have it freshly prepared, and the patient should be directed to test it from time to time with blue litmus paper.

In concluding this essay, I must confess

that I should like to have given more cases in which I have had to rely on strychnia alone; but such cases are very rare, and to have waited until I had collected overwhelming evidence from my own practice alone, would have been to postpone indefinitely the publication of a method which I hope and believe will do something to advance the art of Ophthalmology.

# SYMPATHETIC OPHTHALMIA.

## Sympathetic Ophthalmia.

At the outset of this paper I must confess that my experience of active Sympathetic Ophthalmia has been but small.

Although I have had a large experience of serious injuries of the eye, yet, as I always advise the immediate removal of the organ when I think all useful sight is destroyed, and, in the few instances where my advice is spurned, the patients usually betake themselves elsewhere, on this account or not, I have seen but few cases. These few cases, however, are so remarkable that I venture to bring them before the profession, together with some observations, which the study of them, and of others reported in the journals, has suggested to me.

That we may arrange our ideas about Sympathetic Ophthalmia in some order, and come to some agreement as to what it is, I would suggest that it be

divided into five classes, which would include all cases wherein one eye suffers from the fault of its fellow.

In the first of these I would put the cases wherein the injury to the primary eye is slight, and of a temporary character, such as that caused by the entrance of foreign bodies into the cornea,—dust, sparks, rust, etc.; also the irritation provoked by slight diseases, such as catarrh. These cause distinct irritation in the secondary eye, but this subsides at once without treatment of the latter, when the offending cause is removed from the primary eye.

In the second class I would put those cases in which the injury of the primary eye, though much graver than in the first class, is slight in extent, and where also the sympathetic mischief, though distinct and definite, is not such as would demand enucleation of the primary eye, but which requires treatment by atropine, etc., until such time as the injury to the primary

has quietened down and no longer provokes the secondary.

In the third class I would put those cases in which the primary eye is so injured as to produce such sympathetic inflammation of the secondary as would compel one to enucleate the primary, but in which such enucleation is sufficient of itself to stop the disease in the secondary eye without further treatment.

In the fourth class I would put those cases in which enucleation of the primary eye exercises no appreciable check on the sympathetic disease, which, unless further treated, goes on until all useful vision is destroyed.

As the fifth class requires more detailed explanation than the others, I merely mention it here.

I will pass over the first class, as it would be waste of time to comment on the everyday cases contained in it. It is necessary, however, to describe some cases in the second, which probably

contains fewer cases than the fourth, but perhaps about the same as the third.

The first thing which strikes one in perusing the accounts of cases in these two classes, — second and third, — is *the slight degree of traumatism of the primary eye.*

A typical case of the second class is given by Dr. Samelsohn, of Cologne, in the *Archives of Ophthalmology and Otology*, Vol. v., No. 2, 1876. In this case, a boy of fourteen years, on April 1st, received a lacerated wound, "about two millimetres in circumference," in the sclerocorneal junction, causing prolapse of iris, etc. There was mischief in the fundus; but for this, —as I believe, and will assume in this essay, that sympathetic mischief is alone caused by injury to the ciliary region, *immediate or mediate*, — I will refer the reader to the essay itself for the full account. Iritis and hypopium appeared and reappeared, and on the thirty-ninth day slight ciliary redness and photophobia

in the fellow-eye. It disappeared next day, but came on again a few days afterwards, accompanied by symptoms of kerato-iritis. Atropine, rest in bed, and salines were ordered, and he improved so that he was able to go to school on June 20th, with the secondary eye normal, and the primary eye in the possession of useful sight.

It is somewhat difficult to make out whether there be a mistake in the description of a wound as being "two millimetres in circumference," but if this be true, then it would be about as great as that made by the mere puncture of a Graëfe's knife, and therefore very small.

Another case in this class is given by Mr. Henry Power, in the Ophthalmic Hospital Reports, vol. vii., part 4, page 443. In this also the littleness of the injury is well manifested. A boy of nineteen, on Feb. 28th, 1872, was accidentally stabbed at the inner corner of the left eye with a steel pen, which caused a

prolapse of the iris as big as a pin's-head. This, on the 15th of March, was touched with nitrate of silver, and atropine was applied. On April 1st the *right* was watery, and the prolapsed iris in the left was snipped off. One grain of quinine, with three of grey powder, was ordered thrice daily. On the 4th, Sympathetic Ophthalmia of a mild type was established; for this he was leeched in each temple, atropine was applied, and liquor strychniæ m. iv., tincture of iron m. x., and quinine gr. ij. were given, also thrice daily. Both eyes improved, but remained tender; he was leeched occasionally, and on the 17th, being considerably better, belladonna gr. $\frac{1}{4}$ was given every six hours, in place of the mixture. On the 19th, the right (secondary) eye became worse; on the 20th, belladonna in glycerine was rubbed round the eyes, and the quinine and grey powder were added to the pills; on the 25th the strychnia mixture was given as well, and afterwards the

hypodermic injection of it was added. Besides this, he was blistered. On the 2nd of May, *the breath being slightly tainted with mercury, its use was discontinued*, the mixture being still given.

During this time the eyes had been getting steadily better; and after this, although he had one or two relapses, from which atropine, with leeching, was sufficient to relieve him, they made a very favourable recovery.

In his notes on the case, Mr. Power attributes the result to the use of the atropine and the tonics, and does not allude to mercury, although the boy took, in the beginning of the disease, *thirty-six grains of grey powder, and later on a hundred and seventeen, and then was salivated.*

In the third class, a large proportion, I think, will be afforded by cases wherein foreign bodies lodge in the vitreous or lens, and implicate the ciliary region *mediately*, by causing phakitis, irido-choroiditis, etc., and so gradually producing cyclitis.

Of this sub-class, Mr. Power gives some good illustrations in vol. xi. of St. Bartholomew's Hospital Reports. In Case No. 1, a chip of steel made its way through the cornea to the back of the lens, causing iritis and deep-seated inflammation of the globe. Seven weeks after sympathetic irritation was set up, but was stopped at once by enucleation of the injured eye.

Case 2 is similar in its course, the cause being a No. 6 shot going through the cornea into the lens.

Case 3 is almost the counterpart of Case 2.

Cases 6, 7, 8, and 9 are examples of sympathetic irritation following traumatic cataract, caused by lodgment of chips of metal; whilst in Case 10, noted as one of "lacerated wound of left eye with a piece of china, in June,—sympathetic ophthalmia in November, — both eyes lost," enucleation of the primary eye was followed by the sight of the

secondary recovering, from mere perception, to $\frac{3}{20}$, in seventeen days. In this there appears to have been mere traumatic cataract without lodgment of a foreign body.

And now I come to the most important class of all—the fourth. It is that to which Mackenzie gave the name of Sympathetic Inflammation, and which most authors mean by the term; the first three being usually classed as sympathetic irritation. Of the hopelessly fatal termination of cases of this class we have plenty of instances on record. I believe they are found almost entirely where the primary eye has received an extensive wound in or near the ciliary region, such as the lacerated rupture of the sclerotic caused by the blow of a fist or other blunt instrument; by wounds such as those produced by the explosion of soda-water bottles; and, lastly, by those large wounds which we are directed to make, as close to the ciliary region as possible, in the

various operations for cataract, glaucoma, etc., which have been popular for some time.

For the better illustration of my argument, I will narrate a case which I had under observation from the very beginning of the sympathetic inflammation, and had therefore an opportunity of closely watching its very birth, method of production, and advance.

On Feb. 25th, 1875, a youth, aged twenty-two years, came to the hospital and stated that he had been struck, some days before, over the left eye. It was found that there was a ragged wound, about half an inch long, occupying the upper and inner part of the ciliary region, through which the lens and a considerable part of the iris had escaped. The anterior chamber contained some blood, and there was a black mass, made up of the prolapsed iris and ciliary body, filling up the wound. He had still some perception of light, and scarcely any pain; therefore,

as I had seen several cases of similar injury recover with very useful sight, the eye was bound up and events were waited for. As three weeks passed without any improvement in vision taking place, and as tension of the eye continued to be below the normal, although the wound was cicatrizing, I suggested the propriety of enucleation, to prevent risk to the other eye. He took fright at this, and ran off home; but came back on the third day, March 21st, on account of an attack of pain in the right eye. I found *ciliary redness starting from a space corresponding exactly to the site of the wound in the left eye.* The pupil dilated with sufficient readiness under atropine, and he was relieved thereby, so that it seemed I might reasonably wait for a few days. But this remission was deceptive; the pupil became less and less influenced by the drug, and enucleation of the primary eye, on March 28th, produced no notable change. The right was treated with

atropine, leeching of the temple, etc., but steadily became worse, and in two months there was total posterior synechia ; the small pupil shewing membranous cataract, and there was mere perception of light, with great photophobia and epiphora.

He was discharged in this condition, and lost sight of for some time, when he was seen accidentally in the street, wearing a large green shade ; and later still (1879) his condition was found to be much the same as when he left the hospital.

This short history would, I fear, suit nearly all the cases which have been observed of this, the gravest, form of Sympathetic Ophthalmia.

It is a question whether the attack would have been warded off, had I enucleated at the time when I first proposed the operation, because the disease was observed three days afterwards. Had I done so, and had secondary mischief supervened, doubtless the case would have

been put down as one of Sympathetic Ophthalmia coming on after enucleation, and some might have argued that the attack had been provoked by the operation. As it is, the case illustrates what experience, from the time of Mackenzie downwards, teaches us, namely, that once the *graver* sympathetic process has begun, enucleation, by itself, does not check its progress.

The next case I had to deal with was one of similar origin as regards the amount of traumatism of the primary eye, but which was much more fulminating in character. It had, however, such a very different termination, that I think I need offer no apology for giving it a more permanent record than that afforded by the local Hospital Reports, in the pages of which it has already appeared. It is necessary to do so, moreover, for the explanation of some facts with which later experience has furnished me.

Hector Fraser, aged fifty-two, ship-

wright, was admitted into St. Paul's Eye and Ear Hospital, May 4th, 1877. Some six weeks before admission, a surgeon, finding him suffering from chronic glaucoma of the left eye, proceeded to perform iridectomy. After the patient was etherized, the usual incision was made, and immediately on its completion the eyelids contracted so strongly, as to force out the wire speculum, and then almost to empty the eyeball of its contents. As it was deemed useless to attempt to get out the sector of iris, the lids were closed. Adhesive inflammation followed, and, unfortunately, symptoms of sympathy appeared in the right eye about a month afterwards.

Being from home at the time of his admission, I did not see him till May 7th, when I found the usual symptoms of violent sympathetic inflammation, profuse epiphora, photophobia, general scleral and conjunctival injection, beetle-green iris, etc., the pupil somewhat dilated with

atropine. Of course, the first thing to be done was to enucleate the offending eye, which was now small, soft, and tender, though free from pain, but there was great pain radiating from the right. On the 8th, the left was removed, the retina being found universally detached. The next day the man was rather cheerful on account of the remission of the pain in the right eye and right side of his head; but, as I put it down to the shock of the operation, I did not share his joy, but rather looked forward to an exacerbation the next night, which indeed happened as I feared. The disease increased in severity until the 13th, when, on account of an increase of pain the previous night, I told the matron to leech the temple. Next day I found the reaction caused by the leeching had excited a considerable hæmorrhage into the anterior chamber, from which circumstance the extreme frailty of the eye may be imagined. Then seeing that nothing

but hopeless blindness was left for the poor man if ordinary methods were tried, I resolved to use a very old remedy, which, so far as I know, has not been used with anything like vigour under similar circumstances—namely, mercury.

Now, before this I had been gradually extending the use of mercury in Ophthalmic Therapeutics. Limiting it at first to disease of syphilitic origin, I had been driven by the failure of ordinary treatment to its use in other ophthalmiæ, as those of rheumatic character, and I had abundant reason to be satisfied with the results.

I may say that I almost invariably employ the inunction method, either of the old blue ointment, or of one of Mr. Marshall's oleates of mercury, and that I never hesitate to salivate if I think the disease grave enough to warrant it. I look on as childish the late craze about the great danger of mercury in the hands of a man of ordinary sense: of course I am

aware of the existence of idiosyncrasies; but ordinarily one need not take account of them.

I am very well aware it was used in pre-enucleation times, but then the offending eye was left in its proper orbit; here, however, I had a different case, for I had got rid of the exciting cause, and had only to deal with the disease itself.

I now told the matron to bring him under the influence of mercury as soon as possible, and she acted so vigorously that he was salivated in two days. After this the eye had no history; it simply got well faster than any inflammation comparable to it in violence that I have ever seen. On the 19th, with a convex glass of about 10, he told the time by a watch, and I made out the disc in a hasty examination, finding in it the signs of simple neuritis—viz., woolly whiteness and swelling, with narrowness of vessels: the iris had lost its greenness, and the general redness was almost gone. This improve-

ment continued steadily; and on the 26th he could read $4\frac{1}{2}$, and on 2nd June $1\frac{1}{2}$ with 8 +. The disc presented now a marked contrast with the state shewn in the examination of the 19th, being healthy, and having a large physiological cup, which was well shewn by the binocular.

I may here interpose the remark that this case shews the use of the cup, as allowing a considerable effusion to take place in the nerve without extinguishing its power.

The eye is now free from all signs of disease, save that there are three minute adhesions of the iris to the lens, and by a magnifying glass some points of uveal pigment are visible, shewing that there was a much more extensive adhesion, which became broken down by treatment.

From a discussion which took place on this case at the late Meeting of the British Medical Association, I learnt that mercury had been used in several instances

of late, as in Mr. Power's case above mentioned,* and with, at any rate, better results than the do-nothing treatment. But it was acknowledged by a very eminent surgeon that there is no case known where the recovery from such a violent sympathetic inflammation has been so complete as in the case herein described, and I ascribe this to the free use of the drug instead of the usual timid giving of it.

A few days before the preceding case came under my notice, I removed from the eye of a child the membranous cataract, left after complete Sympathetic Ophthalmia, very reluctantly, and only at the urgent desire of the mother. The history of the case before the operation is shortly thus:—The child, Mary E. Wedge, age 12, on Sept. 3rd, 1873, was cut across the eye with a piece of mug thrown at her by a boy. On Nov. 26th, the eye was said to have been removed at a special hospital, but, from the result-

* See page 195.

ing cicatrix, the operation must have been some form of abscission. At the time of the operation the second eye was "sorer" than the first, so says the mother, but she could see well with it. After this she got gradually worse, and at the time when she applied to me in March, she had mere perception. I removed the membranous cataract on the 10th of April, through a corneal incision, tearing it bodily away with the iris forceps.

There is very little danger in using considerable force to an eye that has gone through a severe inflammation, as such an eye takes no notice of violence which would destroy a healthy eye.

Of course all the vitreous, being fluid, was lost, and the eye collapsed; nevertheless, it speedily plumped out, and the wound gradually healed with the only disadvantage of attachment of the iris. Finding the good effect of mercury in the previous case, about two months after the cataract was removed, when I found that

she had still scarcely more than perception of light, I ordered inunction of mercury, and on the 27th of July, with a $2\frac{1}{2}$ +, she could read $8\frac{1}{2}$ Sn.: on Aug. 8th, with 2 +, $4\frac{1}{2}$, and now she takes her place in one of the Board Schools, and gets through her lessons very creditably.

A great deal of the success attained in this very hopeless case is due to the complete tearing away of the membranous cataract, by which a large pupil was left open. In these cases, I believe it to be the best plan to attempt the removal by tearing rather than by discission, or other cutting operations.

Even if the whole iris were to give way and be removed, I should expect a better result than by any partial cutting operation.

But if this instance of complete cure of this terrible disease, by the combined influence of enucleation and vigorous mercurialization, be no mere freak of

nature, I trust that the days of such destructive inflammation will speedily go by, and that, in future years, we shall not have such cases of cataract to deal with. At the same time, the knowledge of the fact that by the free use of mercury we can check at once, and eventually cure, a Sympathetic Ophthalmia, however grave, will enable us to postpone enucleation of doubtful eyes until such time as we may be certain what to do.

Besides these four classes, there is another, which, I believe, is not as well recognized as it deserves. I mean the various forms of Sympathetic Ophthalmia which come on, long after the primary eye has become quiet and is looked upon as an unsightly, but otherwise harmless, object.

Now, in these last three classes of ordinary Sympathetic Ophthalmia, I think it is usually found that the secondary eye begins to be implicated when the ciliary nerves of the primary eye, immediately

or mediately, are irritated by the contraction of the cicatrix. This contraction, from the peculiar organization of the eyeball, may be prevented for some weeks, months or years,—as by staphyloma,—and the nerves, therefore, be subjected to no such pressure as that consequent on cicatricial contraction ;—the risk of sympathetic mischief may be thus postponed.

But it not infrequently happens that, after a time, a staphylomatous eye gradually contracts, and as gradually some irritation is caused to the ciliary nerves. As these have had their functional power dimmed by long disease, the sympathy displayed by the secondary eye is often of no very active character, and is consequently oftener ignored than remarked. Sometimes, however, the secondary irritation is so great, that treatment becomes necessary, and, under atropine, the attack probably passes off for a time, leaving, nevertheless, the eye somewhat damaged.

I believe, as a rule, the weight of this form of Sympathetic Ophthalmia is spent on the uveal tract, and chiefly on the ciliary body and iris, or of one of them; for it by no means follows that if one of them be gravely involved, the other shall be involved to the same degree. If the iris be the part wholly, or to a much greater degree, affected, then the tension of the globe is below the normal; if the ciliary body be the part mainly affected, then the tension of the globe rises. But as these cases are usually found in young people, in which the tissues are not rigid, as in the adult, the globe stretches, and becomes ovoid and myopic, and it is only after a long time that true glaucomatous symptoms are found.

A case in which the iris was the part chiefly concerned, although the cornea suffered also, affords an example of the partial and intermittent variety of Sympathetic Ophthalmia, and likewise of the

benefit resulting from treatment after the fashion suggested to me by consideration of the cases previously discussed.

Mr. G., aged 32, consulted me on the 24th of August, 1878. He informed me that, on the 12th of July, he had been struck several times over the right eye; that afterwards he had much pain and heat, and at first saw a spot constantly floating before his eye. The eye now presented the signs of general irritation, slight photophobia, and redness. It was clear that most of the following signs had existed before the blows. These were opalescence of the cornea, for a space about a quarter of an inch deep, extending across the cornea, just below the horizontal meridian, slightly trenching on the pupilary area, leaving a clean space above, and very slightly below. The iris was almost universally adherent to the lens, and, in the very small pupil, the lens was covered by a layer of lymph. After several applications of atropine, the

pupil dilated slightly above, leaving exposed a somewhat clearer portion of the lens.

The left eye was wasted down to a mere button, which was very hard, but not painful, or tender.

He wore a 6-inch concave glass, with which, at this time, V = $\frac{3}{100}$. He stated that before he received these blows the eye had always been irritable, and he had often been under treatment for it, both by his usual attendant and by several oculists, foreign and native, who advised him unanimously to leave things alone.

I suggested that the wasted eye was most likely the cause of the repeated inflammation of its fellow, and that, in all probability, if the wasted eye were removed, the secondary eye might, with the aid of appropriate treatment, recover much of its power, and, at any rate, be much less liable to such attacks as had, by this time, rendered it almost useless.

I did not see him after this until

Sept. 23rd, when I found that the eye was less red, but the pupil was more obstructed, and the opacity of the cornea was as well marked as at his first visit.

He now looked on enucleation with more favour, and, in a few days, consented to have it performed on the 19th of October. Before operating, I found vision had improved, so that at nine feet he recognized Sn. 40,—of course, with his 6-inch concave.

The wasted globe was found to contain a calcareous lens, which was the cause of the hardness observed before its removal.

On November the 1st, at fifteen feet, he made out Wecker's 10 m, but after this the improvement was much delayed by the anxieties of a lawsuit in which he was engaged.

Immediately on his recovery from the shock of the operation, I caused the inunction of an ointment composed of equal parts of lard and of the twenty per cent. solution of Marshall's oleate of mercury. This was

not carried out quite so vigorously as I wished; still a good deal of mercury was used.

The good effects on the eye were much more manifest to the observer than the degree of improvement of the sight would seem to indicate.

Shortly after the enucleation, the congestion of the ciliary region cleared up; the cornea also, the opalescent band thinning considerably; also the layer of lymph over the pupilary area became more transparent, so that it was possible, when the pupil was dilated,—the dilatation now being to a slight extent below as well as above,—to make out the disc.

On the 10th of March, 1879, Mr. G. gained his lawsuit, and after this his vision improved considerably; and on April 17th he read Wecker's 7.5 m. at fifteen feet. He is still using the ointment, and I purpose that he do so for some time, until indeed his eye shew no capacity for further improvement.

This is what might be called an almost neutral case, seeing that the ciliary body was affected, as well as the iris, though to a very much less extent, as accommodation was still present,—this being shewn by the embarrassment of it following the instillation of atropine,—whilst, as before mentioned, the mobility of the pupil was extremely small.

The next case, however, is one in which almost the whole weight of the sympathetic inflammation fell upon the ciliary region, and of this, apparently, the circular system of fibres only.

Lydia Dalby, aged 19, came for admission to the Liverpool Blind School in the first week in September, 1878. She stated that her right eye was destroyed by a cut with a penknife when she was five years old. From her description, she had an extensive wound in the cornea, and, as a consequence, adherent iris. This was followed by much pain, lasting fully five months, and then the eye remained very irritable for seven years,

often preventing her sleeping from nocturnal pain. From twelve to seventeen the eye was quiescent, then she went to learn straw-hat making, and had a great deal of night work; this was followed by pain in the eye, and afterwards by twitching and pain in the left eye. This gradually got worse, and the sight also, so that she had to give up her work after fifteen months' perseverance. Nine months after, her sight being reduced to bare perception, she consulted a hospital surgeon, who removed the right eye, which was now somewhat shrunken. After the enucleation the sight of the left eye became quite extinct, and when she applied to me, about a fortnight afterwards, her state was as follows. The anterior chamber was deepened so much as to strike the most careless observer. When the eye was shut, it greatly bulged out the upper lid. The pupil was dilated as much as possible; one or two uveal dots on the lens marked a feeble attempt at adhesion, which had been overcome by the major disease. The media

were perfectly clear, enabling one to see an exceedingly deep cup. The globe was stony hard, and without the faintest perception of light.

As I thought by this time the glaucomatous process was no longer active, I did not operate, but first tried eserine sulphate, gr. iv and ʒj., by itself. As this failed to produce contraction of the iris, after a short time I used the mercurial ointment, and in a few days the pupil was contracted to the size of a pin's head, and the globe was softer. She now had clear perception of light, and I hoped, as the bottom of the cup was not quite blue, but had a reddish tinge, I might get even more acuity, and perhaps even useful sight. This hope has been partially fulfilled. The eserine was found to be necessary, only in much smaller doses, twice daily, to relieve the tension, and the frequent instillation of strychnia was used.

Now, April, 1879, tension is barely 1 +,

and she can note the passage of fingers before her eye. In a bright light, she can count the panes in a window, and, in short, there is useful sight in the eye.

I am by no means devoid of hope that she will see still better than this, though this is something to be proud of.

A striking instance of the unwisdom of leaving a seemingly quiet wasted eye in its orbit is afforded by a pupil at present in the Liverpool Blind School. He is a man aged 37, and he states that when 22 years old he received an injury in the left eye which totally destroyed the sight. Not till *nine years afterwards* did the secondary become affected, but after that time acute Sympathetic Ophthalmia set in, and speedily extinguished all sight, in spite of enucleation of the primary.

The consideration of these cases seems to me to shew that the teaching which we have been receiving from Germany of late years is by no means right. We are told that if there be any sight at all in the

primary eye, although it may be destroying its fellow, yet we are to preserve it, because, forsooth, it is possible that after the secondary eye is destroyed, the primary may have at least perception of light.

One would have thought that such a proposition need only to be clearly stated to carry with it its own condemnation; nevertheless, as it is put forward by grave authority, it is necessary to allude to it.

I am at a loss to understand why we are to keep an eye, often with very doubtful perception of light, when it may at some future time destroy its fellow, at this time perfectly sound.

I say again, that if all *useful* sight be destroyed, either by accident or disease, in any eye, however quiet it may be, without doubt that eye should be removed, unless some general diathetic condition, such as Bright's disease, by threatening life, forbid it; but if I be right in deducing, from the facts above stated, that, in the treatment by enucleation and

mercurialization, we have a perfect control over the severest forms of the sympathetic process, then we are justified in leaving alone a slightly or doubtfully injured eye, and even should slight sympathetic inflammation be set up, in striving by the aid of vigorous mercurialization to save it, before resorting to enucleation.

# APPENDIX.

# APPENDIX.

## NOTE I.

### Hancock's Operation.

To shew the essential difference between Hancock's Operation and Hyposcleral Cyclotomy, I append a description of the former in its author's own words. In a lecture, published in the *Lancet*, Feb. 11th, 1860, he says :—"Introduce a Beer's cataract knife at the outer and lower margin of the cornea, where it joins the sclerotica. The point of the knife is pushed backwards and downwards until the fibres of the sclerotica are divided obliquely for rather more than one-eighth of an inch ; by this incision the ciliary muscle is divided, whilst the accumulated fluid flows by the side of the knife."

If the incision be made as herein directed, I cannot see how it is possible to avoid prolapse of the ciliary body and of the iris, and all the possible future evils of a wound of the ciliary region, and I think it most likely that the frequent occurrence of this gradually led to the abandonment of the operation.

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## NOTE II.

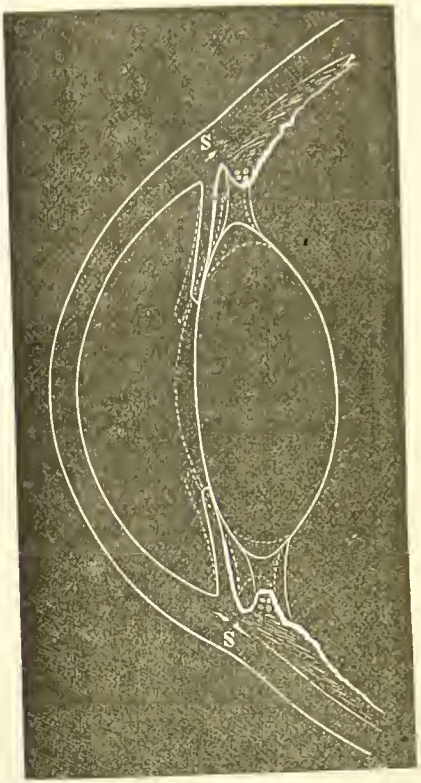
### Theory of Accommodation.

The theory of accommodation put forward in the Essay on Glaucoma is indirectly confirmed by a disbeliever in it. In speaking of accommodation, Landolt (*Burnett's Translation*, pp. 126, 127) says:— "If there existed a muscle which would increase the tension of the zone of Zinn, its action would be to flatten the lens,

and in this case there would be a diminution of refraction, or, in other words, accommodation for objects situated beyond its *punctum remotum*. *Such a muscle would be of great service to myopes, but unfortunately it has no existence, and there can, consequently, be no negative accommodation.* When the lens is flattened, through relaxation of accommodation, it is only abandoned to the elasticity of the zone of Zinn. The action of the ciliary muscle is confined to increasing the curvation of the lens; accommodation can only be *active* and for near distances." And alongside this paragraph he very kindly gives us a diagram, which shews, with all the beautiful clearness which French scientific manuals display, how, if there were such a *tensor ligamenti lentis*, accommodation for distance could be brought about by it.

Before seeing this diagram, I never realized how plain the matter is. Let anyone look at the diagram from Landolt's "Examination of the Eyes," p. 126, which

I here copy, and he can scarcely after




that maintain the passivity of accommodation for distance.

I have yet another tit-bit from Landolt. In section viii., on "The Causes of Ametropia," p. 115, we find:—"The animals

which we have examined, as regards their refraction by means of the ophthalmoscope, such as frogs, rabbits, cats, dogs, &c., are all hypermetropic, sometimes as much as three or four dioptries (about No. 10 of the old system). The fact is the more surprising, as their ciliary muscles are not well developed, and it is highly probable, therefore, that they cannot accommodate accurately for objects close at hand."

Fancy a cat or a terrier, graduates in mousing and ratting, seeing no better than a great-grandfather without his spectacles!

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## NOTE III.

### A Preliminary Symptom.

There is one prodroma of Glaucoma on which much stress is laid by all writers, and that is the rapid advance of presbyopia,

or, as some phrase it, the development of hypermetropia. Seeing that presbyopia, apart from hardening of the lens, depends on failure of the circular ciliary muscle, it is easy to see how this forerunner of Glaucoma occurs, if my theory of its production be admitted.

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## NOTE IV.

### Chronic Glaucoma.

A case, which seems to me to prove up to the hilt what is advanced in this book about Glaucoma and its treatment by Cyclotomy and by Eserine, came to me on the 28th of February. The patient, Mr. K., a gentleman aged fifty-four, was sent to me by my friend Dr. Hodgson Carruthers, of Runcorn, and he stated that whilst living in Ontario, Canada West,

about April, 1878, he had inflammation of the right eye, with great pain. This gradually subsided, but the eye felt weak, and watered all summer ; the sight also was dim, this symptom being greater in the evening. About October, the eye was quite blind, and he had violent pain in the right temple every night. There was no sensible difference in appearance between the two eyes.

In November, he returned to England, and the sight improved for a time, but in the last three or four weeks it has become much worse, and as his own words, given in his written statement of his own case, graphically describe the advance of Chronic Glaucoma, I give them in full. He says :— "This last month (February) I found it very inconvenient to walk about, as I could not see anyone to the right of me, or, if I closed my left eye, I could only see an object at a couple of yards distant and on a level with my eye ; nothing above, below, to the right or the left, so I consulted," &c.

I found very little immediately apparent difference between the two eyes, for the left also shewed some signs of approaching Glaucoma, the tension being slightly in excess, the ciliary veins large, and the disc contained a suspiciously large cup, which was physiological, perhaps so far, but, on contrasting it with that of the left, it was plain that there were not many degrees of difference between them. The sight of this eye was, however, apparently unaffected as yet. The right eye had a larger and much more sluggish pupil; the ciliary veins were large, and the tension about 2 +; there was a deep cup, and the vessels disappeared completely behind its edge, but it was plain, from comparison with the left, that it had been deep to begin with, and, besides, the vessels were hidden only for a short distance behind the edge, and then reappeared. As the eye seemed quiet, I determined to try if eserine alone would cure. But, first of all, I insisted on taking away the prime cause of the Glaucoma, namely, the too

weak spectacles. He was wearing 16 +, and that, too, only occasionally, as he could read for a little time large print without any. I gave him 10 +, and enjoined him strictly not to look at anything near without them. With this treatment alone the left eye soon lost the feeling of discomfort, and gave no further trouble.

I found that with the right V = $\frac{14}{50}$, and I gave him a weak solution of sulphate of eserine to use thrice daily. On Wednesday, March 5th, R = $\frac{14}{30}$, and with 10 + read $2\frac{1}{2}$; but after this, each instillation gave pain, and arterial ciliary injection soon appeared, and V sunk down to $\frac{14}{40}$. As there was more pain also, I thought it best to delay no longer, and performed cyclotomy on the 11th. The operation was so painless that he was unaware it had been done till I informed him of the fact. There was no hitch afterwards, the tension next day being normal, and on the 14th, with 40 +, he made out with some difficulty $\frac{14}{20}$. On the 19th V = $\frac{15}{20}$, and nearly $\frac{15}{5}$m, and

with $\frac{1}{10}$ + he read Wecker's No. 1. On the 20th it was a little better still, but on the 29th it was doubtful whether it was so good, and on April 5th the eye was a trifle harder and vision not so distinct, the field also suffering in extent. Eserine $\frac{1}{32}$ ad ℥j. was again prescribed on the 9th, to be used once at night. On the 12th there was some improvement, and as the eserine had caused pain, it was reduced to $\frac{1}{96}$. This, however, was found to be too weak; it soon decomposed and became inert, so the $\frac{1}{32}$ solution was again used morning and night. Under this the eye keeps its ground, and of late the field has greatly improved. Besides eserine, for the last few weeks, he has been using a 4-grain solution of sulphate of strychnine, in the hope of completely restoring the function of the neuro-retinal tissue. Of course, did not the action of the eserine, by opening, morning and night for some hours, the discharge-pipes, relieve the tension of the globe, strychnine would be of no effect.

I think Mr. K.'s case ought to be read thus:—First, that he had an attack of sub-acute Glaucoma, which, being treated only by bathing with rose-water (I forgot to mention this), subsided gradually into the almost painless chronic form; that this was kept up until the failing sight drove him to seek advice in February; that, under my own care, the eserine, by causing contraction of the circular ciliary muscle, opened the discharge-pipes, lessened tension, and so improved the sight, but also by working an already overworked and inflamed muscle, prepared the way for an acute attack of Glaucoma, had I been unwise enough to persevere with the use of the drug. Had I also, on the other hand, used atropine, I should equally, by stretching the circular muscle through stimulation of the radial fibres, have brought about the same result.

But, by cutting across this tired and inflamed circular muscle by the operation of hyposcleral cyclotomy, I first of all relieved

the tension of it, and so procured both the quiescence of it and its recovery from the inflammation ; and then I induced it, after its recovery, by means of the smallest possible quantity of eserine, to contract, only occasionally, so as not to strain or tire itself, but just enough to allow of the escape of the superabundant aqueous humour, and then to rest quietly until its service was again required. Then, by means of the careful use of the 10 + spectacles, I ensured that it was no longer inefficiently aided in its task of producing near accommodation.

Finally, I say that it is only by using our reason, and intelligently appreciating each step of the process, that we can hope to cure such a confessedly formidable disease as Chronic Glaucoma.

## NOTE V.

In speaking of the action of Iridectomy in Glaucoma, there is one thing which I have omitted to mention and to explain, and that is, why an eye, after a *successful Iridectomy, is softer than in the normal state.* I shall take it that the fact is undoubted. Let it be remembered that I say an eye iridectomized successfully. I know well that often after an Iridectomy, the eye, once the wound is healed, soon becomes hard as before. Any careful reader of what I have written herein will see why; but in cases of successful Iridectomy, how is it that the eye becomes, not of normal tension, as it ought, were the curative power of the operation perfect, but of tension below that of a healthy eye?

The answer is very simple,—granting my premises.

It is a cardinal principle in surgery, that when a wound heals, *it contracts in*

*all its dimensions.* If the wound be linear, it of course first gapes, and the gape then contracts, no matter what it be filled with, iris or lymph; that is, it contracts in a direction at right angles to its length. *But it also contracts in the direction of its length;* that is, the length of the scar is shorter than the length of the incision.

Consequently, in a perfect Graëfian Iridectomy, one done close to the ciliary muscle, when the iris is carefully torn off its attachment to the ciliary muscle, not only do the cut edges of the iris approximate, but the corresponding part of the ciliary muscle must also shorten in like proportion. And to make up for this, the remaining portion of the ciliary body, as well as the iris, must be correspondingly stretched, and any spaces therein, that is to say, lymphatic discharge-pipes, must be correspondingly rendered more patent; and therefore the eye must become softer than natural. Of course, if the

inflammatory process in the ciliary body be of sufficient duration to cause closure of the discharge-pipes all round, an Iridectomy is of no avail, for the contraction of the wound is counteracted by the contraction resulting from the glaucomatous inflammation of the rest of the ciliary body. Hence, as Mr. Hutchinson has said, after the failure of one Iridectomy a second is seldom of any use.

Now, I suppose, no one will argue that tension diminished below the normal is otherwise than harmful, and, therefore, here is another argument against Iridectomy.

That these considerations argue in favour of my operation surely no one can doubt, seeing that in it there is the least possible interference with the parts concerned.

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